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CALTRAIN SAN FRANCISCO
DOWNTOWN EXTENSION PROJECT
CONCEPTUAL DESIGN AND DRAFT EIS/EIR

CalTrain Ridership Forecasting Results Report

PENINSULA CORRIDOR JOINT POWERS BOARD

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ICF KAISER ENGINEERS/DELEUW CATHER TEAM
in association with
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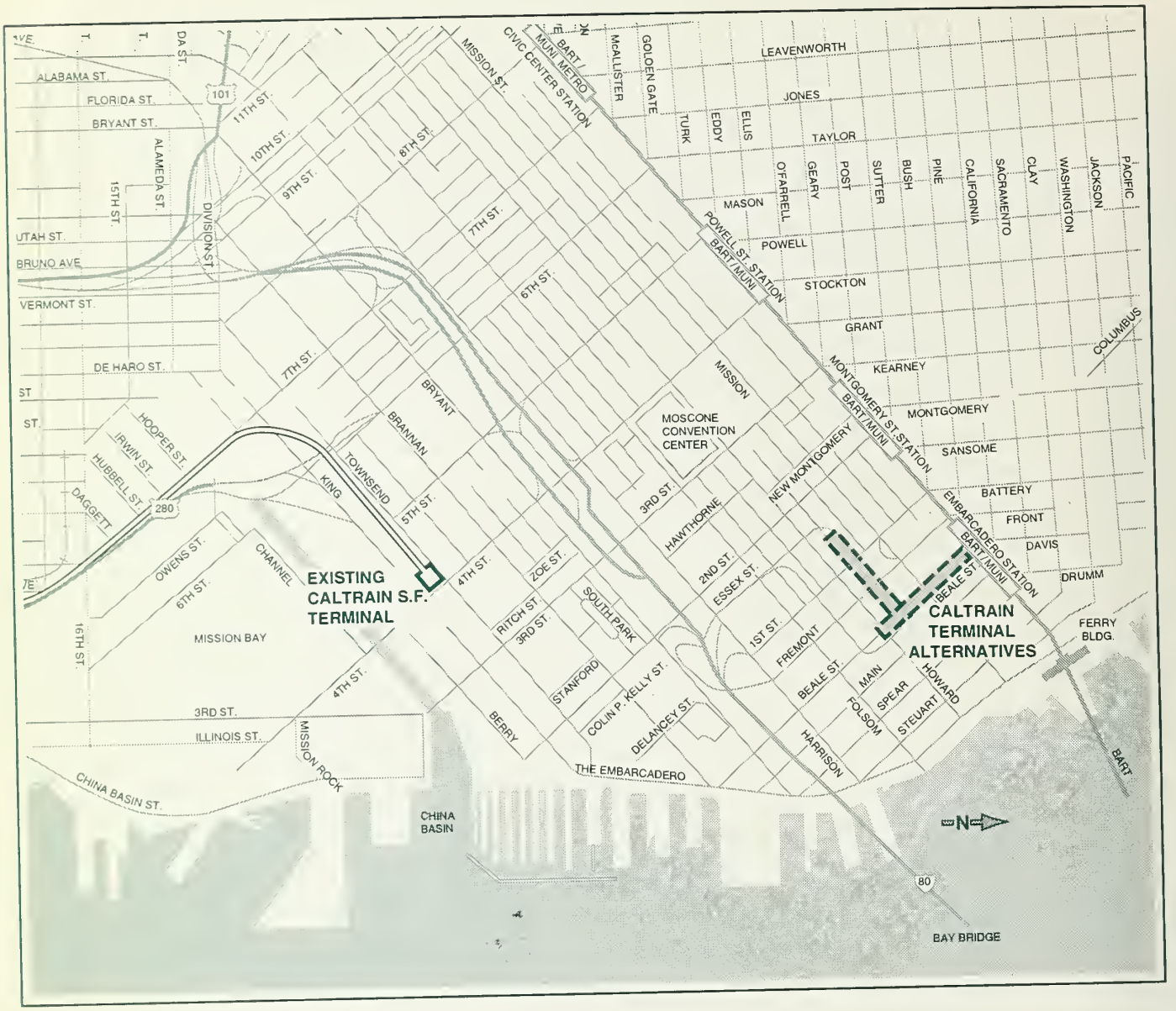
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CIVIC CENTER STATION
POWELL ST. STATION
MONTGOMERY ST. STATION
EMBARCADERO STATION
BART/MUNI
BART/MUNI METRO
THE EMBARCADERO
BAY BRIDGE
FERRY
BLDG.
ALABAMA ST.
FLORIDA ST.
BRYANT ST.
UTAH ST.
BRUNO AVE.
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CALTRAIN SAN FRANCISCO DOWNTOWN EXTENSION DEIS/DEIR

CALTRAIN RIDERSHIP FORECASTING RESULTS REPORT

PREPARED FOR THE

CORRIDOR JOINT POWERS BOARD

PREPARED BY

ICF KAISER ENGINEERS INC.

May 29, 1996

CalTrain ridership
forecasting results
1996.

Executive Summary

The Peninsula Corridor Joint Powers Board (JPB) is proposing to extend the CalTrain commuter rail line from its current San Francisco terminus at Fourth and Townsend Streets to a new terminus at the present location of the Transbay Terminal near Mission and First Streets. The extension project will move the end of the line to a location much closer to the destination of most riders. This report describes the increases in CalTrain ridership expected to result from the project, as well as the expected reductions in travel time, traffic congestion, and automobile use as a result of the project.

Purpose of Project

The CalTrain commuter rail service currently ends one and a half miles short of Downtown San Francisco. Caltrain passengers bound for downtown San Francisco and the Financial District face either a long walk or a bus ride to reach their final destination. The walk is too long to be considered comfortable or attractive. The bus ride entails waiting for the bus, and then a sometimes slow trip through congested city streets. For people considering a CalTrain trip, the bus connection adds another layer of uncertainty: Where do I wait for the bus? Will it show up? How long will it take? What does it cost? Did I get the right one? Where is my stop?

Since BART, AC Transit and Golden Gate Transit serve the Market Street area, but not Fourth and Townsend, transit users who want to transfer between these systems and CalTrain also face the choice of a walk or an extra bus ride. Market Street also serves a high concentration of MUNI bus routes that fan out to serve all parts of the city. Even with the completion of MUNI Metro to Fourth and Townsend, CalTrain passengers with a final destination served by the Market Street bus routes would need to transfer downtown. Transit users are accustomed to transferring once between transit modes, but are much more reluctant to take a trip that requires two transfers. Thus, the remote location of the CalTrain terminal is a strong disincentive for making a multi-system transit trip.

With the CalTrain Extension, trains would stop one block from Market Street. Most riders would be able to easily walk to their final destination in downtown. Riders transferring to BART, AC Transit, Golden Gate Transit or MUNI's Mission and Market Street routes would have a short walk between systems, eliminating the need for a second transfer. The extension would attract new transit riders who did not use CalTrain before because the end of the trip was too inconvenient or convoluted. It would also reduce travel time for existing riders because the trip between Fourth and Townsend and downtown would be much faster on CalTrain's exclusive right-of-way than in a bus sharing city streets with traffic destined to and from the Bay Bridge.

Besides improving CalTrain service, the extension would provide a route for other passenger rail services to reach downtown San Francisco. These could be conventional intercity trains on the

Coast Route to Southern California and/or Monterey, or high-speed trains to the Central Valley, Los Angeles and San Diego. If such services were provided, a downtown station would allow riders to walk to destinations in the Financial District or make easy connections to BART, AC Transit, Golden Gate Transit or MUNI.

Forecast Assumptions and Methods

When travel forecasts are prepared for a project such as this, assumptions must be made about other transportation improvements that are planned. Besides the CalTrain Extension, the other large planned project in the Peninsula Corridor is the BART extension to San Francisco Airport. This report assumes that BART will be extended from Colma to the San Francisco Airport International Terminal and to a joint BART/CalTrain station at Millbrae. It also assumes that the Airport Light Rail System (ALRS) would connect with BART at the International Terminal BART station but would not connect directly with CalTrain. CalTrain passengers wishing to reach Airport destinations would need to transfer to BART, ride BART to the International Terminal station, and then either transfer to the ALRS to reach their final destination at the airport or walk directly from BART to their terminal.

It should be noted, however, that the Peninsula Corridor Joint Powers Board (JPB) recently initiated a study of a direct connection between CalTrain and the ALRS. If a direct connection were provided, it would be more attractive for CalTrain passengers to reach the airport, and CalTrain ridership could be expected to increase above the level forecast in this report.

The forecasts presented in this report were obtained by applying the Metropolitan Transportation Commission (MTC) travel demand forecasting model results originally prepared for the 1994 Regional Transportation Plan (RTP). Though the customary approach for preparing forecasts for a major transit study is to generate a set of travel forecasts specifically for the study, MTC felt that using the existing RTP runs was the best course of action for the study. Utilization of the RTP runs required that a number of adjustments be made to the existing output to make it suitable for preparing ridership forecasts for the Downtown Extension Project. The basis for most of the manual adjustments were forecasting outputs from the San Mateo Countywide model. This model is currently being used by Korve Engineering under separate contracts to analyze transportation alternatives in the county, and to study future market demand for CalTrain. The availability of these outputs provided the opportunity to make adjustments in a comprehensive and systematic fashion.

Purpose of Forecasts

Transit patronage forecasts are a fundamental input into the analysis of fixed guideway transit projects. This environmental review phase seeks to evaluate the environmental impacts of the proposed transit improvements. The number of passengers that will ride CalTrain is important as input to environmental impact analyses, such as air quality, traffic congestion, parking demand, and social equity. Nonetheless, it needs to be recognized that the ridership forecasts and other transportation statistics will also be used to assess the benefits of the CalTrain Downtown Extension Project, and compare the project's relative cost effectiveness with other potential

transportation investments. While this will occur, it must be remembered that the primary objective of this analysis is to assess environmental impacts.

Contents of This Report

Chapter 1 summarizes the process that was used to produce the travel forecasts. It describes the 1994 RTP Alternatives that were used and the CalTrain Downtown Extension alternatives that were analyzed. It also discusses the model's land use/socio-economic inputs and summarizes the manual adjustments that were necessary in order to utilize the RTP model forecasts for the CalTrain extension forecasts.

Chapter 2 presents the forecasting results for the study corridor. This is the most general level of data regarding travel by the different transit and highway modes. For the purposes of this EIS/EIR, the Peninsula Corridor is defined as the major transportation facilities that cross the San Mateo - San Francisco county line. This includes CalTrain, BART, SamTrans bus service to downtown San Francisco, Interstate 280 and US 101 freeways and major arterials.

Chapter 3 presents the next level of ridership and related information on the CalTrain service. This includes data on total system ridership; station boardings and alightings; access mode percentages; auto access demand; and ridership annualization factors. The chapter also reports representative travel times for a sample of typical CalTrain trips.

Chapter 4 reports comparative data to assist in evaluating the CalTrain Downtown Extension alternatives. This takes the form of summaries of data already presented for the Peninsula Corridor and for the CalTrain service.

Ridership Forecast Results

The Downtown Extension alternatives are compared to existing conditions in the following table:

Summary of Forecast Results

Measure	1990	Downtown Extension Alternative	
		No Build 2010	Transbay Terminal 2010
Daily System Entries	21,780	32,250	43,400
Annual Ridership	6.0 million	9.0 million	12.1 million
Daily San Francisco Terminal Entries and Exits	12,900	5,800	17,800

Percent Transfer at San Francisco Terminus in Peak Period	85%	64%	22%
Transit Linked Trips in Corridor	562,000	662,200	667,000
Transit Mode Share -- San Mateo Co. to San Francisco Co.	15%	19%	20%
Transit Mode Share -- Santa Clara Co. to San Francisco Co.	13%	22%	27%
Daily AM Peak Hour Vehicle Hours of Travel (VHT)	373,900	574,300	516,000
Proportion of AM Peak Hour VHT that is Delay	35%	45%	40%
Daily AM Peak Hour Vehicle Miles of Travel (VMT)	8,655,700	11,420,900	11,275,500
AM Peak Hour Roadway Average Speed	23.1 mph	19.9 mph	21.9 mph

With the downtown extension, CalTrain system ridership in 2010 would double compared to 1990. Ridership in 2010 would be 33 percent higher with the extension than with the No Build option. There would be almost 5,000 net new daily riders. CalTrain entries and exits at the San Francisco terminal would increase by almost 40% compared to 1990. The comparison in 2010 is even greater, because by then the BART Airport Extension would be in place, and a significant portion of CalTrain riders would be expected to transfer to BART at the Millbrae station if the CalTrain Downtown Extension is not implemented. There would be a substantial decrease in the percentage of riders that would need to transfer to another transit system at the San Francisco CalTrain terminal. Compared to a transfer rate of 85% in 1990, the CalTrain Downtown Extension would result in a transfer rate of 22% in 2010.

Conclusions

The objectives for the CalTrain Downtown Extension Project include increased transit ridership, as well as reductions in transit travel times, highway traffic congestion, and automobile use. The extension would have the following positive effects on travel in the Peninsula Corridor and the Bay Area:

- CalTrain would have 4,800 more daily riders with the Downtown Extension than it would

have without the extension. These are 4,800 trips that would otherwise be on the freeway. This is a volume equivalent to a new freeway lane.

- The percentage of CalTrain riders that transfer to other transit systems at the San Francisco terminal would drop from 64 percent to 22 percent. This demonstrates the ability for riders to walk to their final destination if CalTrain is extended to downtown.

- Travel times for CalTrain trips to or through downtown San Francisco would be reduced by 6 to 23 percent. Besides saving time for CalTrain passengers, this would make using transit on the Peninsula more time-competitive with using an auto.

- The proportion of delay in regional morning peak hour vehicle travel would drop from 45% to 40%. This would mean less congestion on the region's freeways.

- Regional morning peak hour vehicle miles of travel would drop from 11.42 million to 11.28 million. A reduction in vehicle miles would correspond to a reduction in air pollution.

- Regional daily person hours of travel in vehicles would drop from 6.6 million to 6.2 million. This would be a savings of 400,000 hours every day.

Overall, the CalTrain San Francisco Downtown Extension Project would increase transit ridership, reduce transit travel time, reduce freeway congestion, improve air quality, allow most CalTrain riders to walk to their final destination in Downtown San Francisco instead of taking a shuttle bus, and improve connections with BART, AC Transit, Golden Gate Transit and MUNI.

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1.0 Forecasting Process

The ridership forecasts for the Downtown Extension Project are based on MTC travel demand model forecasts prepared for the 1994 Regional Transportation Plan (RTP). This approach was developed in a series of meetings between the JPB, MTC modeling staff, and the consultant team at the initiation of the EIS/EIR work effort. While the customary approach for preparing forecasts for a major transit study is to generate a set of travel forecasts specifically for the study, MTC recommended the use of its existing 1994 RTP forecasts for this study. in order to be consistent with previous travel forecasting in the Peninsula Corridor and to use a forecasting methodology that had already been concurred with by the Federal Transit Administration (FTA)

Utilization of the RTP runs required that a number of adjustments be made to the existing output to make it suitable for preparing ridership forecasts for the downtown extension project. In part, this is because the scenarios included in the RTP were designed to test different regional level policy approaches to investing in the Bay Area's entire transportation system over the next 20 years. As a result, each RTP alternative embodied different assumptions about the regional transportation network. Ideally, for a study of a single transit improvement, model forecasts are prepared such that only the project is varied and the rest of the regional transportation network is held constant. Manual modifications and procedures were needed to make the RTP model output emulate that produced by a traditional analysis approach.

The issues that precipitated the need for adjustments are summarized later in this chapter, and are described in more detail in the *MTC Ridership Forecasting Travel Model and Assumptions Report*, September 15, 1995. The major issues were:

- Changes in the configuration of connections between CalTrain, BART, and the Airport Light Rail System;
- Assumptions for modeling the parking constraints at Peninsula CalTrain stations;
- Inherent assumptions in the demographic forecasts; and
- Number of daily trains and the MTC model's sensitivity to midday CalTrain service differences.

Most of the manual adjustments made to RTP model results used forecasting outputs from the San Mateo Countywide model. This model is currently being used by Korve Engineering under separate contracts to analyze transportation alternatives in San Mateo County, and to study future market demand for CalTrain. The availability of these outputs provided the opportunity to make adjustments in a comprehensive and systematic fashion.

Discussions with MTC resulted in the consensus that adjustments to CalTrain boardings for the Transbay Terminal Alternative (with 86 and 60 daily trains) could be estimated using the San Mateo Countywide transportation model. Generally, the regional statistics reported for the corridor are those in the 1994 RTP forecasts, with minor adjustments to maintain consistency. These regional statistics include home-based work and non-work linked transit trips, home-based work and non-work transit mode share, air passengers on CalTrain, net new transit riders in the CalTrain corridor, average daily person hours of travel, AM peak hour regional Vehicle Miles of Travel (VMT) by volume-to-capacity (V/C) ratio, AM peak hour speeds, screenline traffic volumes and V/C.

1.1 RTP Alternatives Used for Forecasting

A total of seven alternatives were contained in the 1994 RTP. Three of these seven alternatives were used in developing ridership forecasts for the CalTrain Downtown Extension:

- Draft Project Alternative (Fourth and Townsend CalTrain Terminal);
- Alternative 1A (Transbay Terminal CalTrain Terminal); and
- Final Project Alternative (Market and Beale CalTrain Terminal)

The Draft RTP Project Alternative assumed that the San Francisco CalTrain terminal would be at 4th and Townsend. RTP Alternative 1A assumed that the CalTrain terminal would be at the Transbay Terminal. Both alternatives assumed that CalTrain service would be increased to 87 one-way trains each weekday. They also assumed that CalTrain travel times would be reduced by 10 percent to reflect improvements to the CalTrain signaling system and fewer grade crossings. These two alternatives formed the backbone of the ridership forecasting effort.

The RTP Final Project Alternative, which assumed CalTrain would be extended to a new terminal at Market and Beale Streets, was originally included in the forecasting effort, but was subsequently dropped as a result of the JPB's actions on January 4, 1996.

1.1.1 Draft RTP Project Alternative

The Draft RTP Project Alternative defines an investment strategy where new funding is dedicated to cover shortfalls for street and road maintenance, transit system capital assets, and seismic retrofit of seven state-owned bridges which cross the Bay and delta. The Draft RTP Project Alternative also expands the region's transit network, including several light rail extensions in Santa Clara County and a BART extension to serve the San Francisco Airport. Existing transit systems are also upgraded, including replacement of some of AC Transit's diesel buses with electric trolley

buses, and a new connection between BART and the Amtrak Capitols intercity passenger rail service at Union City.

The Draft RTP Project Alternative improves the High Occupancy Vehicle (HOV) system on the region's highways by adding new lanes on high-volume corridors and closing gaps in the existing HOV system. Other highway improvements include interchange modifications, auxiliary lanes, and selective road widening to relieve bottlenecks. Arterial improvements primarily relate to relieving routes in congested highway corridors.

Operational improvements include a Traffic Operation System (TOS) designed to smooth traffic flows and improve incident management on the region's highways. Another improvement is "Translink," an operational strategy to improve coordination of existing transit systems through a universal fare collection system for bus and rail operators. The Draft RTP Project Alternative includes funding for signal timing and arterial improvements such as left-turn channels and spot widening to improve traffic flows.

The RTP also provides freight mobility improvements, such as the Port of Oakland joint-intermodal terminal, improvements to railroad tunnels serving the Port of San Francisco, a truck bypass lane at the I-205/580 interchange, and truck weigh-in-motion facilities. Finally, funding for undefined bicycle and pedestrian improvements is included for each county. These improvements are generally determined by cities and counties through local processes on an annual basis.

1.1.2 RTP Alternative 1A

This RTP alternative reflects the priorities of the county Congestion Management Agencies (CMA's), county sales tax programs for transportation improvements, transit providers, and other local and regional transportation planning agencies. The projects on this list were drawn primarily from several plans and programs:

- Congestion Management Programs,
- Countywide Plans,
- Sales Tax Measure Programs,
- Short-Range Transit Plans,
- MTC Resolution 1876 Regional Rail Agreement, and
- Priority Lists for federal Surface Transportation Program (STP), federal Congestion Management and Air Quality (CMAQ), and state Flexible Congestion Relief (FCR) funds.

The main differences between the Draft RTP Project Alternative and RTP Alternative 1A are described in the RTP Draft EIR, Table 3.1-1. RTP Alternative 1A would result in more street and

highway lane miles than the Draft Project Alternative. RTP Alternative 1A also contains several significant transit projects not contained in the Draft Project Alternative. These include the BART extension to Warm Springs in south Fremont and the Capitol Corridor light rail project in San Jose. However, there are no differences in either the highway or transit networks in San Francisco and San Mateo Counties and within the CalTrain corridor of Santa Clara County. Therefore, the networks are similar in terms of comparing CalTrain alternatives.

1.1.3 Final RTP Project Alternative

The RTP Final Project model forecast was conducted in June 1994. It tested a modified version of the Draft RTP Project definition. The modifications resulted from comments received on the Draft EIR for the RTP. In terms of the Peninsula Corridor, the most significant difference between the Draft and Final RTP Project Alternatives is that CalTrain was assumed to terminate at Fourth and Townsend in the Draft RTP Project, and at Beale and Market in the Final Project.

1.1.4 Using RTP Forecasts for Caltrain Project

The definitions of each RTP alternative transportation network were reviewed to identify any major differences in network definition that could affect the forecasting results. The differences were determined to be minor with respect to CalTrain ridership. However, measures that compare overall system performance, such as highway delay or net new transit riders do reflect other changes in the highway and transit networks besides the CalTrain extension. Therefore, when reviewing the results in this report, in terms of macro statistics, the reader must remember that differences between the RTP alternatives that are *representing* the CalTrain alternative may be the result of the CalTrain extension, or may be the result of a combination of other unrelated changes inherent in that particular RTP alternative.

1.2 Definition of CalTrain Alternatives to be Analyzed

Two alternatives were analyzed for the Downtown Extension Project: a No Build Alternative and a Transbay Terminal Site Alternative. A third alternative of an extension to Market and Beale Street was considered earlier in the study. On January 4, 1996, the JPB decided to eliminate this alternative from further consideration because of its potential for neighborhood disruption, expected high cost of tunneling, and engineering constraints at the Market/Beale terminal site.

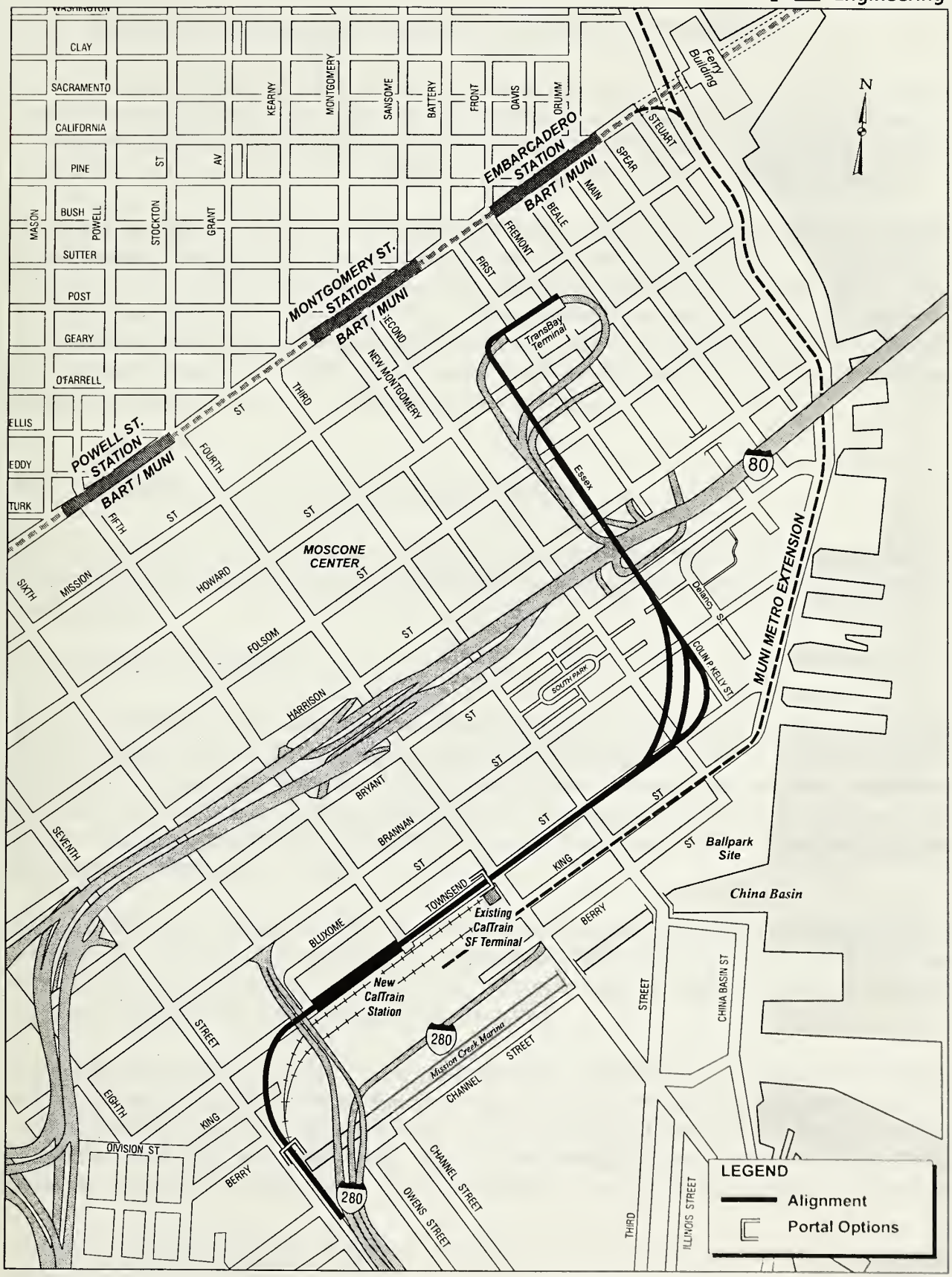
1.2.1 No Build

This alternative retains the present CalTrain terminal at Fourth and Townsend and is used as a basis for comparison with other downtown connection options. MUNI Metro service between the CalTrain terminal and downtown San Francisco is assumed to be provided. In the context of a traditional FTA transit investment study, this alternative would be called the TSM Alternative, since it assumes a number of systemwide transportation improvements.

1.2.2 Transbay Terminal

This alignment would follow Townsend Street to the vicinity of Second Street or Third Street as shown in Figure 1.1. At this point, the alignment would turn north and continue through the Colin P. Kelly/Essex corridor to the Transbay Terminal, which would be razed. CalTrain would be provided with a new underground station to be constructed on the old Transbay Terminal site. There are three options for the portal location alignment along Townsend Street. Two of these options include a new CalTrain station between Fifth and Sixth Streets to serve Mission Bay. One option does not include this new station.

Korve Engineering



CALTRAIN SAN FRANCISCO DOWNTOWN EXTENSION

Figure 1.1

BUILD ALTERNATIVE ALIGNMENT OPTIONS

1.3 Land Use, Economic, and Demographic Forecasts

Land use/economic/demographic forecasts measure the growth and changes in households, working households, household population, total population, employed residents, total employment by six classifications, mean household income, and single and multi-family dwelling units. ABAG's Projections '92 for the years 1990 and 2010 was used for the MTC 1994 RTP model runs.

Following completion of transportation forecasts for the 1994 RTP ABAG, RTP ABAG released Projections 94. Projections '94 assumes a lower rate of growth in the Bay Area. The application of Projections '94 in the model presumably would produce slightly lower ridership figures due lower population and employment figures for 2010. The San Mateo Countywide Model uses Projections '94 modified to reflect recent analyses produced in conjunction with the cities in San Mateo County, as described in Section 1.7. The adjusted results reported in Chapters 2 and 3 reflect these more recent and lower land use/economic/demographic forecasts.

1.4 Number of CalTrain Weekday Trains

CalTrain currently operates 60 one-way trains each weekday. One additional train is operated on at midnight Friday nights. Therefore, the maximum number of trains that currently operate on a weekday is 61.

1.4.1 MTC RTP Assumptions

For the 1994 MTC RTP model forecasts, the Draft Project and Alternative 1A assumed that CalTrain would have 87 one-way trains operating each weekday in 2010. The Final Project Alternative run assumed 65 trains. The 87- and 65-train scenarios evolved from a series of decisions made over time as travel forecasts were prepared for the Peninsula Corridor. This evolution is described in the *MTC Ridership Forecasting Travel Model Assumptions Report*, Korve Engineering, September 15, 1995.

For the Downtown Extension EIS/EIR, a fundamental difference that needed to be addressed is the issue of 87 trains in the Draft Project and Alternative 1A runs, and the 65 trains in the Final Project run. The change from 87 trains to 65 trains is entirely the result of increasing off-peak CalTrain headways from thirty minutes to sixty minutes.

Headways are indirectly modeled through their effect on waiting time, by establishing a single or set of relationships between waiting time and headways, sometimes called a wait-time factor. The MTC forecasts assumed a wait-time factor of 0.5, meaning that there is a relatively uniform distribution of arrivals at a transit station and that the average person waits an amount of time equal to one-half the train headway. Thus, if the trains ran every ten minutes, the waiting time

would be five minutes. This modeling method applies to transit service where trains arrive so frequently that a user does not need to refer to the schedule. The rider simply goes to the station at any time, and expects that a train will arrive within a short time.

If headways are longer, such as 30 minutes or 60 minutes, riders are more likely to arrive according to the train schedule. They cannot rely on arriving randomly at the station, because this might entail a wait of 25 minutes or more, if they just missed the previous train. To model this behavior, the MTC forecasts assumed a maximum headway of 20 minutes, on the supposition that this would be the effective headway perceived by riders because they would time their arrival at the station using their informed knowledge of the train schedule. Consequently, in the MTC model, there was a degree of insensitivity to improvements in midday train service that exceeded the 20-minute headway threshold. For example, the model assumes that off-peak service operating at 30 minute headways (as in the Draft Project and Alternative 1A runs) is just as attractive as service operating at 60 minute headways.

1.4.2 Downtown Extension Project Assumptions

The number of weekday trains assumed for the Downtown Extension Project are different than that assumed in the MTC RTP forecasts. The Transbay Terminal alternative obtained from the San Mateo Countywide Model assumed the operating parameters shown in Table 1.1, and two operating scenarios were forecast, one with 60 weekday trains and one with 86 weekday trains in 2010. Since the No Build Alternative forecasts were derived using adjustment factors based on the Transbay Terminal forecast, the results reported in Chapter 3 reflect the Downtown Extension Project assumptions with respect to the number of weekday trains. In addition, the San Mateo Countywide model is more sensitive to differences in midday train frequencies and does not embody a maximum headway parameter, meaning that the results also reflect the differences between operating 60 and 86 trains per day.

1.4.3 Peak Load Factor Assuptions

The following assumptions were made with respect to the derivation of peak load factors, based on MTC RTP model results:

- 7 cars per train in the peak direction for the Transbay Terminal Extension Alternative
- 5.5 cars per train (average) in the peak direction for the No Build Alternative
- 148 passengers per car - galley car, 139 passengers per car - cab cars
- 21 per cent of home-based work CalTrain boardings occur in the peak direction, in the AM peak hour, or 5921 passengers
- 11 per cent of non-work CalTrain boardings occur in the peak direction, in the AM peak hour, or 1508 passengers

- 10 percent of air-passenger CalTrain boardings occur in the peak direction, in the AM peak hour, or 285 passengers
- Hourly demand during the balance of the peak period is 70 percent of the peak hour demand
- 7713 peak hour, peak direction passengers
- 77 percent of peak hour boardings are in the peak direction (derived from San Mateo County Model results)

Table 1.1

CalTrain Service Characteristics

Measure	1990	60 Trains		86 Trains	
		No Build	Transbay Terminal	No Build	Transbay Terminal
Number of Stations	26	32	33	34	34
Peak Trains	32	33	33	34	34
Base Trains	20	27	27	52	52
Peak Load Factor	0.73	0.73	1.00	0.81	0.94

Note: CalTrain segment from 4th/Townsend to Transbay Terminal assumed at 1.28 miles

Source: MTC, ICF Kaiser

1.5 Connections Between CalTrain, BART, and the Airport

All of the RTP alternatives assumed that a new Caltrain/BART/Airport Light Rail Transit System transfer station would be constructed near the airport west of Route 101. This station would allow transfers between CalTrain, BART, and the Airport Light Rail System (ALRS). The ALRS would carry passengers from the transfer station directly to stations at each of the airport terminals and to employment centers elsewhere in the airport complex. The *Ridership Forecasting Methodology and Assumptions Report* contains a description of the history of the BART Extension alignment decision process and a detailed description of the alignment and transfer options.

Following completion of the RTP, the BART Board and the SamTrans Board adopted a preferred route for the BART SFO Extension that splits BART service into two branches in San Bruno. One branch would serve the planned International Terminal and the second branch would serve a joint BART/CalTrain station in Millbrae. In this configuration, the ALRS would connect with BART at the International Terminal BART station but would not connect directly with CalTrain. Passengers disembarking at the International Terminal BART station would still use the ALRS to reach other

terminals and employment areas. CalTrain passengers wishing to reach Airport destinations would have to transfer to BART at the Millbrae station, ride BART to the International Terminal station, and then either transfer to the ALRS to reach their final destination at the Airport or walk directly from BART to their terminal.

This complicated series of transfers would be less attractive than the direct transfer between CalTrain and the ALRS assumed in the RTP model forecasts. The Transbay Terminal Alternative from the San Mateo Countywide model, which was used to adjust the RTP forecasts, assumes the current plan for connection between BART, CalTrain, and the ALRS. Therefore, airport-related trips on CalTrain were factored down in the Downtown Extension Study to properly represent the most recent operating plan.

1.6 Network Assumptions

The transit network contained in the travel demand forecasting model includes the following facilities and services:

1.6.1 BART Extension to San Francisco Airport

BART and the connecting services to the airport are held constant under both Downtown Extension Project alternatives. BART would be extended from Colma to South San Francisco, San Bruno, the San Francisco International Airport and Millbrae. In this scenario, the BART route would serve new stations at Hickey Boulevard and at Tanforan Shopping Center. At Tanforan, the route would split, with half of the trains going to a terminal station at the new Airport International Terminal, and half going to a joint BART/CalTrain station at Millbrae Avenue. A BART shuttle service would operate between Millbrae and the Airport. The Airport light rail system is assumed to operate between the International Terminal BART station and other terminals and employment centers at the airport.

1.6.2 CalTrain

In the No Build Alternative, the San Francisco terminal is assumed to be at Fourth and Townsend.

In the Transbay Terminal Alternative, there is an intermediate station on Townsend Street between Fifth and Sixth Streets. The downtown terminal is located on the blocks between Minna and Natoma Streets, and between First and Beale Streets.

1.6.3 SamTrans

It is assumed that if the CalTrain extension was implemented, the SamTrans bus network would be adjusted to drop express routes that would duplicate service provided by the extension. For the Transbay Terminal alternative, all nine of the SamTrans express routes serving downtown were assumed to be deleted: 1F, 7F, 16F, 17F, 18F, 19F, 47F, 48F, and 49F.

In the No Build Alternative SamTrans service was assumed to be unchanged.

1.6.4 MUNI Metro

Under both alternatives, MUNI Metro light rail service would be extended from the Embarcadero Station along The Embarcadero and King Boulevard to a new station at Fourth Street and King Boulevard (planned to open by early 1997). This new service would provide a convenient transfer between CalTrain and MUNI Metro at the Fourth and Townsend CalTrain Station. As part of implementing the MUNI Metro extension, duplicate service on MUNI bus routes 32-Embarcadero and 80X would be eliminated, and Routes 81X and 82X would be restructured.

1.7 Adjustments Using the San Mateo Countywide Model

As described earlier in this report, existing MTC model forecasts were used to develop transportation information for the project. Because these forecasts did not directly evaluate the impact of different Caltrain Downtown Extension terminal locations and operating scenarios (e.g., number of daily trains), the forecasts had to be adjusted. The San Mateo Countywide Model was used to make these adjustments in a systematic fashion.

The San Mateo Countywide model has the following characteristics that are helpful in the effort to assess ridership for the CalTrain Downtown Extension:

- The size of the travel analysis zones in San Mateo County are smaller than those used in the regional model. This means that for a given geographic area, there are more zones in the San Mateo Countywide model than in the regional model. As a result, the level of analysis can be finer-grained for issues such as comparing access times to CalTrain stations. There will be more zones around a station, and each zone can have its own access travel time. When the zones are larger, a single average travel time would be used to represent all of these zones. If there are variations in population density within the large zone, such as higher densities near the train station, they would be averaged out. But with

smaller zones, these higher density areas would be analyzed discretely, giving a better representation of likely travel behavior.

- The land use assumptions reflect the most current plans and expectations for growth in San Mateo County. As part of the model development process, a bottom-up approach was used to develop forecasts for population and employment growth. Each city in the County reviewed the ABAG Projections '94 and made adjustments reflecting their plans. As shown in Table 1.2, there are significant differences for several cities, especially in the northern part of the County. These new forecasts will be included in ABAG's Projections '96, so they represent the latest available information.

- The mode choice component of the model includes a multi-step decision-making process that mimics that of a potential transit user. The regional model first determines whether a trip will be made on transit or by auto. If the transit mode is selected, then the model determines which sub-mode will be used to access the transit system and assigns all of the demand to use the best access mode. The choice to take transit is made without considering the relative advantages and disadvantages of the access portion of the trip. In contrast, the San Mateo Countywide model considers the convenience of the transit system access opportunities as part of the overall decision whether to take transit or auto, and assigns transit trips on the sub-modes relative to their convenience or utility.

- The San Mateo Countywide model is sensitive to differences in off-peak train headways, and uses a different approach to wait time than the regional model, which was described in Section 1.4.

- The San Mateo Countywide model incorporates the air passenger sub-model for San Francisco Airport, and provides the means for estimating the air passenger trips on CalTrain based on the external SFO intermodal station.

The San Mateo Countywide transportation model was used for the very specific task of making adjustments to the MTC RTP Alternative 1A which is representing the Transbay Terminal Alternative with 86 daily trains in this analysis. The adjustments are needed due to changes in land use, a different intermodal station at SFO, different transfer fare assumptions between BART and CalTrain, the fare surcharge at Daly City BART, the need to normalize station level demand against base-year observed station entries and exits, and other less major forecasting differences.

The relationship between the MTC RTP Alternatives was maintained by using the Transbay Terminal 86 train alternative as a pivot point. For example, if the entries and exits at 4th/Townsend were 10,000 and 8,000 under the RTP Draft Project Alternative (No Build) and RTP Alternative 1A (Transbay Terminal), respectively, then the corresponding ratio of 1.25 (10,000/8,000) was applied

to the entries and exits at 4th/Townsend under the adjusted Transbay Terminal Alternative, to arrive at the adjusted entries and exits at 4th/Townsend under the adjusted No-Build Alternative.

For example, If the entries and exits at 4th/Townsend under the adjusted Transbay Terminal Alternative were 1,500, then the entries and exits at 4th/Townsend under the adjusted No-Build Alternative would be 1,875 (because 1,500 times 1.25 equals 1,875). This exercise was conducted for every CalTrain station to derive the adjusted CalTrain boardings for the No-Build Alternative with 86 trains.

The San Mateo Countywide Transportation Model was then used to test an alternative with 60 daily trains to the Transbay Terminal. The station level results were used to estimate the adjusted CalTrain boardings for the No-Build Alternative with 60 trains using the same procedure described above.

Table 1.2
Comparison of ABAG Projections '94 and 1995 San Mateo Countywide Land Use Data Base

ABAG City or Subregional Area/ Planning Area	Households		Jobs	
	Baseline 2010 San Mateo LUIS	2010 ABAG Projections '94	Baseline 2010 San Mateo LUIS	2010 ABAG Projections '94
ATHERTON	2,540	2,503	2,694	2,909
BELMONT	10,914	10,758	12,991	13,208
BRISBANE	2,352	2,228	14,089	8,788
BURLINGAME	13,328	13,335	29,252	29,083
COLMA	1,263	610	3,526	2,001
DALY CITY	33,169	33,347	22,445	28,749
EAST PALO ALTO	8,679	8,679	4,250	3,907
FOSTER CITY	13,091	13,128	15,994	17,527
HALF MOON BAY	5,692	5,692	3,919	3,091
HILLSBOROUGH	3,876	3,876	1,071	1,257
MENLO PARK	14,563	14,570	31,191	31,384
MILLBRAE	8,362	8,341	8,544	6,133
PACIFICA	14,357	14,237	7,310	4,758
PORTOLA VALLEY	2,891	2,795	1,137	1,216
REDWOOD CITY	37,671	39,067	55,051	50,894
SAN BRUNO	15,305	15,305	15,694	18,709
SAN CARLOS	12,513	12,512	16,708	17,480
SAN MATEO	40,533	41,239	52,286	57,214
SOUTH SAN FRANCISCO	21,452	20,634	42,446	39,787
WOODSIDE	2,126	2,126	1,176	1,386
HALF MOON BAY UNINC.	5,367	7,159	1,729	2,052
SF AIRPORT	0	0	41,664	44,077
REMAINDER	4,705	3,191	1,408	1,286
SAN MATEO COUNTY	274,749	275,332	386,575	386,896

Countywide totals derived from Projections '94 revised tract forecasts may differ from previously published ABAG subregional forecasts.

SF Airport Baseline Forecast for 2010 based on projected buildout (2006) of San Francisco International Airport Master Plan, per Final Environmental Impact Report

Source: Projections '94, ABAG; San Mateo County jurisdictions; AFIA Master Plan FEIR, Economic & Planning Systems, Inc.

2.0 Corridor Level Transportation Benefits

This chapter describes the general transportation impacts and benefits of the CalTrain Downtown Extension Project alternatives. General transportation impacts and benefits address consequences of the project on a large area. They include:

- **systemwide transit-linked trips**, which are defined as a trip from the rider's origin to the rider's destination. For example, a trip that includes a bus ride to a BART station and then a ride on BART is considered to be one transit-linked trip.

- **mode share**, which is the percentage of all daily trips that use transit.

- **transfers**, which are the number of times during a transit trip that the passenger must change from one transit vehicle to another.

- **other travel statistics**, such as vehicular travel volumes across screenlines, average roadway speeds, and hours of travel delay.

The results reported in this chapter apply to the Peninsula Corridor, which is defined as the major transportation facilities that cross the San Mateo - San Francisco County line. This includes CalTrain, BART, SamTrans bus service to downtown San Francisco, Interstate 280 and US 101 freeways, and major arterials.

The RTP travel demand forecasts used in this study resulted from applying a computer model that was driven by two primary inputs: 1) transit and highway network coding that represents, in computer descriptions, the available transportation system for each of the transit alternatives described above; and, 2) MTC regional demographic forecasts that account for the level of land use activity in each of the Transportation Analysis Zones (TAZs) contained in the MTC model area.

The output from these models, patronage forecasts, are a key measure of the transit mobility provided by each alternative. These forecasts of transit ridership also are used to assess other factors such as air quality benefits, roadway congestion relief, revenue and fare box projections, energy use savings and vehicle fleet requirements.

2.1 Demographic and Travel Growth in the Bay Area

The underlying assumptions regarding population and travel growth provide useful background to the corridor results. In 1990, the nine-county Bay Area contained 6.0 million people and 3.1 million jobs. By the year 2010, the Bay Area is projected to add nearly 1.5 million new residents and more

than 1.0 million new jobs. This growth represents a 25 percent increase in population, and a 33 percent increase in jobs over the twenty-year time frame.

By comparison, total person trips in the Bay Area are forecast to increase by 31 percent--from nearly 18 million to more than 23 million. Of these trips, about 24 percent are "home-based work (HBW) trips," that is, trips either from home to work or from work to home. Each Bay Area resident is forecast to make more trips each day--3.12 trips per day in 2010, up from 2.97 in 1990.

The number of automobiles owned in the Bay Area is forecast to increase by nearly 1.5 million, an increase of 37 percent. The growth in auto ownership reflects increasing household incomes. Average household income is forecast to rise from $56,000 in 1990 to $71,300 by 2010 (in constant 1990 dollars).

These are only a few demographic trends that will affect travel patterns around the Bay Area during the next twenty years. Chapter 2 of the *1994 Regional Transportation Plan* provides a more comprehensive overview of demographic trends and travel patterns.

2.2 Demographic and Travel Growth in the Peninsula Corridor

In 1990, the three Peninsula counties of San Francisco, San Mateo, and Santa Clara had 2.87 million residents and 1.77 million jobs. These counties are projected to add a total of 510,000 new residents and 340,000 new jobs. The growth represents an 18% increase in population, and a 19% increase in employment. Thus, the growth on the Peninsula will be less rapid than that for the Bay Area as a whole, which will have a 25% population growth and 33% job growth.

In contrast, household incomes are higher on the Peninsula and are expected to grow more than the rest of the Bay Area. In 1990, the mean household income in the Peninsula counties was $58,500. This is projected to grow to $75,800 by 2010 (in constant 1990 dollars). This is a 30% growth rate, compared to the expected growth of 27% for the Bay Area as a whole.

The growth trends for person trips in the Peninsula Corridor between 1990 and 2010 are shown in Table 2.1. Total travel in the corridor is expected to grow 22 percent, from 7.8 million trips in 1990 to 9.5 million trips in 2010. Travel from San Mateo County to San Francisco will grow from 206,000 to 237,000 trips, a 15 percent increase. Travel from Santa Clara County to San Francisco will grow from 24,000 trips to 29,000 trips, a 21 percent increase. Travel from San Francisco to San Mateo will also grow, from 157,000 trips to 174,000 trips, an 11 percent increase. Travel from San Francisco to Santa Clara will not change.

Table 2.1
Corridor HBW Person Trips

County From\To	San Francisco	San Mateo	Santa Clara	Total
1990				
San Francisco	394,188	50,928	12,315	457,431
San Mateo	123,629	285,880	68,519	478,028
Santa Clara	11,615	48,888	1,031,944	1,092,447
Total	529,432	385,696	1,112,778	2,027,906
2010				
San Francisco	449,613	67,191	14,575	531,379
San Mateo	145,890	336,223	75,402	557,515
Santa Clara	14,290	60,767	1,312,430	1,387,487
Total	609,793	464,181	1,402,407	2,476,381

Corridor Non-Work Person Trips

County From\To	San Francisco	San Mateo	Santa Clara	Total
1990				
San Francisco	1,034,746	106,363	11,101	1,152,210
San Mateo	82,477	1,157,347	97,950	1,337,774
Santa Clara	12,433	76,518	3,211,206	3,300,157
Total	1,129,656	1,340,228	3,320,257	5,790,141
2010				
San Francisco	1,212,962	106,504	8,725	1,328,191
San Mateo	91,473	1,362,695	106,967	1,561,135
Santa Clara	14,985	80,640	3,997,173	4,092,798
Total	1,319,420	1,549,839	4,112,865	6,982,124

Corridor Total Person Trips

County From\To	San Francisco	San Mateo	Santa Clara	Total
1990				
San Francisco	1,428,934	157,291	23,416	1,609,641
San Mateo	**206,106**	1,443,227	**166,469**	1,815,802
Santa Clara	**24,048**	**125,406**	4,243,150	4,392,604
Total	1,659,088	1,725,924	4,433,035	7,818,047
2010				
San Francisco	1,662,575	173,695	23,300	1,859,570
San Mateo	**237,363**	1,698,918	**182,369**	2,118,650
Santa Clara	**29,275**	**141,407**	5,309,603	5,480,285
Total	1,929,213	2,014,020	5,515,272	9,458,505

SOURCE: MTC 1994 Travel Model Results

2.3 Transit Linked Trips

Transit linked trips represent a key measure of patronage expressed in terms of total trip interchanges by transit. Linked transit trips are the product of mode-choice estimation, i.e., the number of trips that choose to use the transit mode, for each zone-pair interchange. A transit linked trip describes the entire trip from origin to final destination. In contrast, unlinked trips are the result of an assignment of linked trips, and are represented by the transit boardings on each transit mode. A transit linked trip can be composed of two or more unlinked trips. In the earlier example, the bus ride to the BART station is one unlinked trip and the ride on BART is another unlinked trip. Trips-by-mode, and therefore linked transit trips, are estimated separately for work- and non-work purposes. Linked trips, rather than unlinked trips, are customarily used for forecasting purposes because they are more easily compared with auto trips.

Comparisons of the 1990 and 2010 linked transit trips by alternative for work, non-work, and total trips are presented in Table 2.2 and are summarized by county. The Transbay Terminal Alternative shows an increase in home-based work and non-work linked transit trips compared to the No Build Alternative. The number of transit trips made from San Mateo and Santa Clara Counties to San Francisco in particular show an increasing trend between the No-Build and the alternative to extend CalTrain to downtown San Francisco.

Table 2.2
Corridor HBW Transit Linked Trips

County From\To	San Francisco	San Mateo	Santa Clara	Total
1990				
San Francisco	185,989	5,682	962	192,633
San Mateo	26,110	10,061	2,584	38,755
Santa Clara	3,079	2,322	30,107	35,508
Total	215,178	18,065	33,653	266,896
No Build				
San Francisco	181,984	8,313	1,498	191,795
San Mateo	37,414	9,702	2,021	49,137
Santa Clara	4,329	2,217	32,905	39,451
Total	223,727	20,232	36,424	280,383
Transbay Terminal				
San Francisco	181,999	8,379	1,606	191,984
San Mateo	38,029	9,643	2,048	49,720
Santa Clara	5,150	2,302	33,096	40,548
Total	225,178	20,324	36,750	282,252

Corridor Non-Work Transit Linked Trips

County From\To	San Francisco	San Mateo	Santa Clara	Total
1990				
San Francisco	235,016	1,403	0	236,419
San Mateo	4,908	9,894	118	14,920
Santa Clara	0	61	43,566	43,627
Total	239,924	11,358	43,684	294,966
No Build				
San Francisco	292,337	2,275	271	294,883
San Mateo	8,116	17,384	1,615	27,115
Santa Clara	2,052	771	56,957	59,780
Total	302,505	20,430	58,843	381,778
Transbay Terminal				
San Francisco	292,330	2,308	291	294,929
San Mateo	8,190	17,385	1,615	27,190
Santa Clara	2,135	771	56,986	59,892
Total	302,655	20,464	58,892	382,011

Corridor Total Transit Linked Trips

County From\To	San Francisco	San Mateo	Santa Clara	Total
1990				
San Francisco	421,005	7,085	962	429,052
San Mateo	31,018	19,955	2,702	53,675
Santa Clara	3,079	2,383	73,673	79,135
Total	455,102	29,423	77,337	561,862
No Build				
San Francisco	474,321	10,588	1,769	486,678
San Mateo	**45,530**	27,086	**3,636**	76,252
Santa Clara	**6,381**	**2,988**	89,862	99,231
Total	526,232	40,662	95,267	662,161
Transbay Terminal				
San Francisco	474,336	10,654	1,877	486,867
San Mateo	**48,467**	27,027	**3,663**	79,157
Santa Clara	**7,783**	**3,073**	90,053	100,909
Total	530,586	40,754	95,593	666,933

SOURCE: MTC 1994 RTP Travel Model Results and Korve Engineering, Inc.

2.4 Transit Mode Share, Mode Shifts, and Travel Time Savings

Travel by transit as a percentage of total travel is another important measure of patronage to compare across the range of alternatives. Comparisons of the 1990 and 2010 transit mode share by alternative for work, non-work, and total trips are presented in Table 2.3. Small increases in the overall transit mode share for home-based work trips are noted between the no-build and the CalTrain Downtown Extension alternative, with virtually no change in the overall total (work plus non-work) transit mode share. Significant transit mode shares are forecasted for trips made from San Mateo and Santa Clara counties to San Francisco for the Transbay Terminal Alternative, with increases in the work and non-work transit mode shares for these interchanges.

Implementation of the CalTrain Downtown Extension would be expected to cause shifts in ridership among the major transit systems on the Peninsula, which are SamTrans, CalTrain and BART, as well as auto modes. Results from the San Mateo Countywide model indicate the following general effects of the downtown extension of CalTrain on travel that is produced or attracted in San Mateo County:

- 10 per cent reduction of SamTrans bus trips[1];
- 1 per cent reduction in BART trips;
- 0.2 per cent reduction in drive-alone trips;
- 0.04 per cent reduction in 2-person shared-ride trips; and
- 3 per cent reduction in 3-person shared ride trips.

The total estimated transit time savings associated with the CalTrain Downtown Extension is 5,854 passenger hours. This estimate is based on the benefit of the downtown extension to users of CalTrain when the downtown extension is in place. This estimate does not reflect potential minor disbenefits associated with the downtown extension, such as longer travel times for some users of SamTrans express buses which would be eliminated with the downtown extension.

[1]Where a SamTrans bus is the primary mode of travel. Trips that use a SamTrans bus to access a CalTrain or BART station are not included in this statistic.

Table 2.3
Corridor HBW Transit Mode Share

County From\To	San Francisco	San Mateo	Santa Clara	Total
1990				
San Francisco	47.18%	11.16%	7.81%	42.11%
San Mateo	21.12%	3.52%	3.77%	8.11%
Santa Clara	26.51%	4.75%	2.92%	3.25%
Total	40.64%	4.68%	3.02%	13.16%
No Build				
San Francisco	40.48%	12.37%	10.28%	36.09%
San Mateo	25.65%	2.89%	2.68%	8.81%
Santa Clara	30.29%	3.65%	2.51%	2.84%
Total	36.69%	4.36%	2.60%	11.32%
Transbay Terminal				
San Francisco	40.48%	12.47%	11.02%	36.13%
San Mateo	26.07%	2.87%	2.72%	8.92%
Santa Clara	36.04%	3.79%	2.52%	2.92%
Total	36.93%	4.38%	2.62%	11.40%

Corridor Non-Work Transit Mode Share

County From\To	San Francisco	San Mateo	Santa Clara	Total
1990				
San Francisco	22.71%	1.32%	0.00%	20.52%
San Mateo	5.95%	0.85%	0.12%	1.12%
Santa Clara	0.00%	0.08%	1.36%	1.32%
Total	21.24%	0.85%	1.32%	5.09%
No Build				
San Francisco	24.10%	2.14%	3.11%	22.20%
San Mateo	8.87%	1.28%	1.51%	1.74%
Santa Clara	13.69%	0.96%	1.42%	1.46%
Total	22.93%	1.32%	1.43%	5.47%
Transbay Terminal				
San Francisco	24.10%	2.17%	3.34%	22.21%
San Mateo	8.95%	1.28%	1.51%	1.74%
Santa Clara	14.25%	0.96%	1.43%	1.46%
Total	22.94%	1.32%	1.43%	5.47%

Corridor Transit Mode Share

County From\To	San Francisco	San Mateo	Santa Clara	Total
1990				
San Francisco	29.46%	4.50%	4.11%	26.66%
San Mateo	15.05%	1.38%	1.62%	2.96%
Santa Clara	12.80%	1.90%	1.74%	1.80%
Total	27.43%	1.70%	1.74%	7.19%
No Build				
San Francisco	28.53%	6.10%	7.59%	26.17%
San Mateo	**19.18%**	1.59%	**1.99%**	3.60%
Santa Clara	**21.80%**	**2.11%**	1.69%	1.81%
Total	27.28%	2.02%	1.73%	7.00%
Transbay Terminal				
San Francisco	28.53%	6.13%	8.06%	26.18%
San Mateo	**20.42%**	1.59%	**2.01%**	3.74%
Santa Clara	**26.59%**	**2.17%**	1.70%	1.84%
Total	27.50%	2.02%	1.73%	7.05%

SOURCE: MTC 1994 RTP Travel Model Results and Korve Engineering, Inc.

2.5 Transfers Between Modes

The number of transfers is a key measure of transit convenience. Transfers can occur among all transit services. A lower number of transfers can indicate that service is being provided more directly between an origin and a destination. Many trips made on transit typically involve a transfer, particularly if the trip was made by walking from the origin zone to the first transit vehicle. The transfer rates were calculated by first calculating the number of transfers. The number of transfers is derived by subtracting total transit linked trips from total transit boardings. The total number of transfers divided by the total number of linked transit trips yields the proportion of trips that involve a transfer. The regional transfer rates of 0.66 and 0.62 for the No-Build and Transbay Terminal Alternatives, respectively, were calculated using these conventions. The transfer rates decrease with the CalTrain Downtown Extension alternative as compared to the No-Build alternative, implying that the extension would provide more direct service between the Peninsula and downtown San Francisco.

Changes in transfer patterns at two major interchange stations on the CalTrain route were also examined. As shown in Table 2.4, there would be a relatively high number of transfers between BART and CalTrain at the Peninsula intermodal transfer facility in Millbrae. This number would drop by more than 75 percent if the CalTrain Downtown Extension was implemented. In Downtown San Francisco, 1,400 transfers would be made between BART and CalTrain if the CalTrain extension was built, as shown in Table 2.5. At both stations, the number of transfers between other transit systems would remain about the same.

Table 2.4
Transit Transfers at Peninsula Intermodal Facility

		HBW Transfers Between:			NW Transfers Between:		
RTP	CalTrain Extension	BART & CalTrain	BART & Bus/LRT	CalTrain & Bus/LRT	BART & CalTrain	BART & Bus/LRT	CalTrain & Bus/LRT
Draft Project	No Build	8,050	5,735	820	3,347	1,095	216
Alt. 1A	TBT	2,236	5,006	873	324	845	235

Source: MTC 1994 RTP Travel Model Results

Table 2.5
Transit Transfers in Downtown San Francisco

		HBW Transfers Between:			NW Transfers Between:		
RTP	CalTrain Extension	BART & CalTrain	BART & Bus/LRT	CalTrain & Bus/LRT	BART & CalTrain	BART & Bus/LRT	CalTrain & Bus/LRT
Draft Project	No Build	0	8,185	2,319	0	6,144	1,081
Alt. 1A	TBT	1,001	8,215	2,282	395	5,962	1,418

Source: MTC RTP 1994 Travel Model Results

2.6 Transit Trips to Airport

San Francisco Airport is one of the major activity centers along the Peninsula Corridor, both for air passengers and airport employees. An extension of CalTrain service closer to the center of downtown San Francisco could affect the number of people using CalTrain to reach the Airport. Results from the RTP model forecasts pertaining to transit riders with airport destinations were extracted and summarized, as shown in Table 2.6. These air passenger transit trips are based on a BART and CalTrain intermodal station west of US 101, with a BART shuttle between this station and the new International Terminal. At the International Terminal BART station, passengers could transfer to the Airport Light Rail System.

Table 2.6
Total Air Passengers on Transit (Entries + Exits)

Downtown Extension Alternative	Passengers
No Build	1,570
Transbay Terminal	2,850
Difference	1,280

Source: MTC 1994 RTP Travel Model Results

These figures do not reflect the assumptions or results of the ongoing JPB study of a direct connection between CalTrain and the ALRS.

2.7 Net New Transit Riders

The difference in total transit linked trips between the Transbay Terminal Alternative and the No Build Alternative is commonly referred to as "net new transit riders." Net new transit riders are typically estimated by comparing the transit trip tables for two alternatives to assess the number of trips that would be made on transit instead of highway modes, if the transit improvement were implemented. The difference between the two transit trip tables are attributed to the differences between the two underlying networks, assuming that the land use alternatives are identical. If the two underlying transit networks differ by a single transit improvement, the net new transit riders can be assumed to arise as a consequence of that improvement.

As described in Chapter 2, there a number of differences between the definition of the CalTrain downtown extension used for these forecasts and that assumed in the MTC 1994 RTP model runs. There are also differences in the underlying network assumptions and demographic assumptions. Therefore, the number of net new transit riders forecast in the RTP model runs needed to be

manually adjusted to reflect these different assumptions. The adjustments made occurred in two areas. The first area was a focused analysis of travel market segments in the Peninsula corridor described in the transit linked trips trip table. The second area was an analysis of the parking requirements for the Build Alternative at Peninsula CalTrain stations. Demand under the Build Alterative could not be served unless Peninsula CalTrain station parking was expanded.

2.7.1 Focused Market Area Analysis

The net-new transit riders estimate was adjusted for a focused analysis of market areas by analyzing specific trip interchanges to and from geographic areas in the corridor. The focused analysis of the net-new transit riders between different market areas was predicated on the following three concepts:

- There are several trip interchanges for which the CalTrain extension would be less attractive than SamTrans express bus service.

- For most of the trip interchanges, the CalTrain extension to Transbay Terminal is identical in benefits to the CalTrain extension to Market/Beale.

- Extending CalTrain to Market/Beale as opposed to Transbay Terminal results in a travel time difference of about one minute, as described in the report, "Pedestrian Access Analysis from the Beale Street Station", September 1995. This difference in travel time would have an impact on short trip interchanges only.

In applying these adjustments, the net-new transit riders for the Transbay Terminal and Market/Beale CalTrain Downtown Extension Alternatives are 1,685 and 2,058, respectively.

The difference between the Transbay Terminal and Market/Beale Extension Alternatives net-new rider statistics were reviewed. Although previous forecasting efforts may have suggested that the Market/Beale Alternative attracted slightly more trips than the Transbay Terminal Alternative, the inclusion of an underground moving sidewalk from the terminal to Market Street in the Transbay Terminal Alternative, combined with the distribution of jobs within walking distance to the CalTrain downtown terminus does much to equalize the differences between the two options. Since the difference between a Market/Beale Alternative and a Transbay Terminal Alternative is negligible, the average of 1,685 and 2,058 or 1,871 riders was taken as the adjusted net-new transit riders for the Transbay Terminal Alternative.

2.7.2 Adjustments for Unconstrained Parking Supply at the Peninsula CalTrain Stations

As described in Section 4.4, the San Mateo Countywide model and recently collected data relative to CalTrain Peninsula station parking utilization were reviewed and used to adjust the net-new rider forecast for unconstrained parking conditions. It was estimated that 2,490 additional parking spaces will be needed to serve home-based work (HBW) vehicle demand for this alternative. To estimate the net-new riders resulting from the provision of parking at CalTrain stations, a factor of 50 per cent was employed representing the proportion of the trips related to these parking spaces that are net new trips, in that they would not use other modes to get to CalTrain if the additional parking spaces were not added. An average park and ride auto occupancy factor of 1.165 was also used, so that the resulting change in new-new riders would be 2,901.

2.7.3 Adjusted Net New Riders

Based on the adjustment of net-new riders by focused analysis of riders between different market areas and by the removal of Peninsula CalTrain station parking constraints, the net-new transit riders for the Transbay Terminal Alternative is 4,772 (2,901 + 1,871). The net-new riders prior performing the focused analysis and removing the parking constraint was 394. Table 2.7 summarizes the number of net new riders for each county interchange. The largest gain is for travel from San Mateo to San Francisco, with 2,900 net-new riders. This is followed by travel from Santa Clara to San Francisco, with 1,400 net-new riders.

Table 2.7
Corridor Net New Transit Riders Downtown Extension

County From/To	San Francisco	San Mateo	Santa Clara	TOTAL
San Francisco	15	66	108	189
San Mateo	2,937	-59	27	2,905
Santa Clara	1,402	85	191	1,678
TOTAL	4,354	92	326	4,772

2.8 Highway Travel Benefits (VMT, VHT, Delay, Congestion)

The RTP model forecasts produce several statistics that summarize travel conditions and performance of the regional roadway facilities. The measures that were relevant to the Downtown Extension Project include AM peak hour speeds on arterial roadways, AM Peak Hour Distribution of Vehicle Miles Traveled (VMT) by volume-to-capacity (V/C) ratios, and AM peak vehicle hours of delay compared with total vehicle hours of travel. These statistics are summarized in Table 2.8.

2.8.1 Average AM Peak Hour Roadway Speeds

This data has been compiled at the regional levels. In addition to the CalTrain extension, the other factors that could influence roadway speeds are the implementation of the traffic operations system (TOS) program, and the provision of additional capacity, either mixed-flow or HOV lanes. As shown in Table 2.8, projected AM peak speeds decrease by 14 percent between 1990 and the 2010 No Build condition from 23.1 mph to 19.9 mph. AM peak speed would increase by 10 percent under the Transbay Terminal Alternative, demonstrating that it would relieve congestion somewhat on the roadways that parallel CalTrain.

2.8.2 A.M. Peak Hour Distribution of Vehicle Miles Traveled (VMT) by Volume-to-Capacity (V/C) Ratios.

Three categories of volume-to-capacity (V/C) ratios are given: below 0.75 (level-of-service A through C); 0.75 to 1.0 (level-of-service C through E); and greater than 1.0 (level-of-service F). Roadway facility types are classified as: 1) freeways; and 2) other facilities (expressways and arterials). The Transbay Terminal Extension alternative would result in decreased VMT on all facilities, compared with the No-Build alternative. With the Extension Alternative, the distribution of VMT shifts slightly from v/c ranges of 0.75 and above, to those less than 0.75. The Extension Alternative indicated lower VMT levels in the v/c ranges greater than 1.0, compared with the No-Build alternative.

2.8.3 Vehicle Hours Of Delay Compared to Total Vehicle Hours of Travel (VHT)

Comparing A.M. peak hour total vehicle hours of delay (VHD) to total vehicle hours of travel (VHT) gives an estimate of the proportion of total AM peak hour travel time resulting from roadway congestion. The Transbay Terminal Extension Alternative would result in a lower percentage of delay, 40 percent compared with 45 percent for the No-Build Alternative.

2.8.4 Screenline Traffic Data

In the RTP analysis, A.M. peak hour highway speeds and volume-to-capacity (V/C) ratios were calculated at a number of screenline locations on heavily-traveled key Bay Area routes, the most relevant of which are the San Mateo/San Francisco County line and the San Mateo/Santa Clara County line. The AM traffic volumes and volume-to-capacity (v/c) ratios for both screenlines are presented in Table 2.9.

2.8.4.1 San Mateo - San Francisco County Line.

The overall v/c ratio on northbound arterials and freeways for the Transbay Terminal Extension Alternative decreases compared with the No-Build option. The southbound freeways v/c ratio also drops for the Extension Alternative.

2.8.4.2 San Mateo - Santa Clara County Line.

The northbound freeways show mixed results at this screenline, with the ratio on I-280 decreasing with the Transbay Terminal Extension Alternative, and the ratio increasing on US 101. The southbound arterials also indicate a decrease in v/c with the Transbay Terminal Extension Alternative, compared with the No-Build Alternative. The southbound freeways show a decrease in the v/c ratio.

Table 2.8
Daily Vehicle (Auto) Travel

Downtown Extension Alternative		No Build	Transbay Terminal
MTC 1994 RTP Alternative	Existing 1990	RTP Draft Project	RTP Alternative 1
Avg Daily Person Hours of Travel In Vehicles	4,679,581	6,600,144	6,181,471
AM Pk. Hr Vehicle Hours of Travel	373,900	574,300	515,967
AM Pk. Hr Vehicle Hours of Delay	130,600	255,700	205,651
Percent Delay	**35%**	**45%**	**40%**
AM Pk. Hr. Regional VMT by v/c ratio			
Freeways			
less than 0.75	1,604,800	1,467,400	1,796,900
0.75 - 1.0	1,507,900	1,499,400	1,606,900
greater than 1.0	1,968,100	3,656,800	3,283,700
All	5,080,800	6,623,600	6,687,500
Expressways and Arterials			
less than 0.75	1,811,200	1,879,300	2,037,100
0.75 - 1.0	855,900	1,110,500	1,070,400
greater than 1.0	907,800	1,807,500	1,480,500
All	3,574,900	4,797,300	4,588,000
All Facilities			
less than 0.75	3,416,000	3,346,700	3,834,000
0.75 - 1.0	2,363,800	2,609,800	2,677,300
greater than 1.0	2,875,900	5,464,400	4,764,200
All	8,655,700	11,420,900	11,275,500
AM Pk. Hr Speeds on All Roadways (mph)	**23.1**	**19.9**	**21.9**

SOURCE: Tables 3.2-2, 3.2-6, 3.2-8 1994 Regional Transportation Plan Draft EIR, April 1994, and Korve Engineering, Inc.

Table 2.9
AM Peak Hour Screenline Traffic Volumes and Capacities

Downtown Extension Alternative/ MTC 1994 RTP Alternative	1990 Existing Vehicles	V/C	2010 No Build Vehicles	V/C	Transbay Terminal/RTP 1A Vehicles	V/C
San Mateo - San Francisco County Line						
Northbound Roadways						
US-101	6,375	0.86	7,417	1.00	7,792	1.05
CAL-1	3,250	0.59	3,583	0.65	3,500	0.63
I-280	5,958	0.81	7,458	1.01	6,833	0.92
Arterials	1,708	0.16	2,500	0.23	2,375	0.22
Freeways	15,583	0.77	18,458	**0.91**	18,125	**0.89**
Southbound Roadways						
US-101	7,288	0.98	8,263	1.12	7,881	1.07
CAL-1	3,559	0.48	4,068	0.55	4,195	0.57
I-280	2,288	0.31	3,263	0.44	3,093	0.42
Arterials	3,178	0.29	4,110	0.38	4,110	0.38
Freeways	13,136	0.59	15,593	**0.70**	15,169	**0.68**
San Mateo - Santa Clara County Line						
Northbound						
US-101	5,129	0.92	6,207	0.84	6,336	0.86
I-280	3,491	0.47	5,345	0.72	5,086	0.69
Arterials	3,276	0.28	4,310	0.37	4,138	0.35
Freeways	8,621	0.67	11,552	**0.78**	11,422	**0.77**
Southbound						
US-101	7,456	1.34	7,807	1.06	7,588	1.03
I-280	4,737	0.64	5,351	0.72	5,263	0.71
Arterials	5,965	0.51	6,579	0.56	6,404	0.55
Freeways	12,193	0.94	13,158	**0.89**	12,851	**0.87**

SOURCE: Detailed Travel Forecast Results, AM Peak Hour Person Travel at County Screenlines and Rail Transit Forecasts, 1994 RTP June 1994

3.0 CalTrain Results

The forecast results reported in this chapter provide a picture of how the CalTrain Downtown Extension will serve the transit market. As described in Chapter 2, the CalTrain Results were developed by applying the MTC RTP results to the output of a base forecast obtained from the San Mateo Countywide model. The final section of this chapter presents station boardings and alightings for the extension of CalTrain to the Transbay Terminal if a replacement station at the 4th and Townsend site is not provided.

3.1 Station Boardings and Alightings

Daily ridership and station entries and exits were forecast for each alternative, as shown in Table 3.1. The two columns under the Transbay Terminal Extension Alternative are the base forecast obtained from the San Mateo Countywide model. The No Build forecast was derived from the base forecast using the relationships between the two alternatives that appeared in the RTP results.

In both the No Build and Build Alternatives, the 86-train option produces 8 to 9 percent more riders than the 60-train option.

3.2 Travel Time Comparisons for Sample Trips

Transit travel times across the alternatives are a good comparison measure of system performance. Key trip interchanges were selected to represent major travel movements within the corridor. The relative travel times among the alternatives differ because of in-vehicle travel time, wait time, walk time, number of stops along the route, and the need to transfer. The trips analyzed are shown in Table 3.2. The components of these trips are graphically depicted in Figures 3.1, 3.2 and 3.3. Data obtained from the San Mateo Countywide model was used to determine travel times between competing modes. The Transbay Terminal Extension Alternative results in a total savings of 7 to 10 minutes, accounting for a varying percentage of improvement in total travel time. As shown in Table 3.2, the level of improvement ranges from 6% for the longest trips to 23% for the shortest trips.

Table 3.1
Caltrain Daily Boardings and Alightings

Station	1990 Existing	Extension to Transbay Terminal		No Build	
		86Trains	60Trains	86Trains	60 Trains
Transbay Termina	-	17,800	17,400	0	0
4th/Townsend	12931	3,600	3,400	5,800	5,500
22nd Street	455	200	100	100	100
Paul Avenue	99	500	500	200	200
Bayshore	372	200	200	100	100
South SF	984	1,100	1,100	400	400
San Bruno	980	1,000	900	900	800
Millbrae	1075	6,000	5,200	4,800	4,200
Broadway	763	1,200	1,200	1,200	1,200
Burlingame	1182	2,000	1,800	1,500	1,400
San Mateo	1155	2,600	2,300	2,200	1,900
Hayward Park	1224	2,100	1,900	1,900	1,700
Hillsdale	1981	4,500	4,100	3,300	3,000
Belmont	1184	2,700	2,500	2,500	2,300
San Carlos	1350	2,400	2,400	2,300	2,300
Redwood City	1700	2,800	2,600	2,800	2,600
Atherton	462	900	600	900	600
Menlo Park	1539	2,600	2,500	2,600	2,500
Palo Alto	2124	5,200	4,900	5,100	4,800
California Avenue	1919	3,600	3,200	3,600	3,200
Castro	456	1,200	1,100	1,200	1,100
Mountain View	1700	3,100	2,900	3,000	2,800
Sunnyvale	1703	3,900	3,600	3,800	3,500
Lawrence	1065	2,300	2,100	2,100	1,900
Santa Clara	1194	2,400	2,200	2,200	2,000
College Park	208	1,300	1,100	1,300	1,100
San Jose	3747	5,900	5,400	5,500	5,000
Tamien	-	2,600	2,400	2,100	1,900
Capitol	-	600	600	600	600
Blossom Hill	-	100	100	100	100
Morgan Hill	-	200	200	200	200
San Martin	-	0	0	0	0
Gilroy	-	200	200	200	200
Entries + Exits	43,552	86,800	80,700	64,500	59,200
System Entries	**21,776**	**43,400**	**40,350**	**32,250**	**29,600**

SOURCE: MTC and San Mateo Countywide Travel Demand Model

Table 3.2
Travel Time Comparisons for Selected Trips

1. San Jose to San Francisco

Trip Segment	Access	CalTrain		MUNI Shuttle			CalTrain Extension		TOTAL	Travel Time
Segment Compenent	Drive	Wait	Ride	Wait	Ride	Walk	Ride	Walk		Improvement
1990	4	3	91	2	7	4	-	-	111	
No Build	4	3	83	2	7	4	-	-	103	
Extension to TBT	4	3	81	-	-	-	2	3	93	10%

2. Sunnyvale to San Francisco

Trip Segment	Access - Bus			CalTrain		MUNI Shuttle			CalTrain Extension		TOTAL	Travel Time
Segment Component	Walk	Wait	Ride	Wait	Ride	Wait	Ride	Walk	Ride	Walk		Improvement
1990	6	4	11	3	54	2	7	4	-	-	91	
No Build	6	4	11	3	49	2	7	4	-	-	86	
Extension to TBT	6	4	11	3	47	-	-	-	2	3	76	12%

3. San Mateo to San Francisco

Trip Segment	Access	CalTrain		MUNI Shuttle			CalTrain Extension		TOTAL	Travel Time
Segment Component	Drive	Wait	Ride	Wait	Ride	Walk	Ride	Walk		Improvement
1990	3	2	39	2	7	4	-	-	57	
No Build	3	2	35	2	7	4	-	-	53	
Extension to TBT	3	2	33	-	-	-	2	3	43	19%

4. Burlingame to San Francisco

Trip Segment	Access	CalTrain		MUNI Shuttle			CalTrain Extension		TOTAL	Travel Time
Segment Component	Drive	Wait	Ride	Wait	Ride	Walk	Ride	Walk		Improvement
1990	2	2	32	2	7	4	-	-	49	
No Build	2	2	29	2	7	4	-	-	46	
Extension to TBT	2	2	27	-	-	-	2	3	36	22%

5. San Bruno to San Francisco

Trip Segment	Access	CalTrain		MUNI Shuttle			CalTrain Extension		TOTAL	Travel Time
Segment Component	Drive	Wait	Ride	Wait	Ride	Walk	Ride	Walk		Improvement
1990	9	2	22	2	7	4	-	-	46	
No Build	9	2	20	2	7	4	-	-	44	
Extension to TBT	9	2	18	-	-	-	2	3	34	23%

6. San Francisco to San Francisco Airport Terminal

Trip Segment	Access	MUNI Shuttle		CalTrain Extension		CalTrain		Airport Light Rail			TOTAL	Travel Time
Segment Component	Walk	Wait	Ride	Wait	Ride	Wait	Ride	Wait	Ride	Walk		Improvement
1990	4	2	7	-	-	4	30	2	5	2	56	
No Build	4	2	7	-	-	2	27	2	5	2	51	
Extension to TBT	3	-	-	2	2	-	25	2	5	2	41	20%

7. North Beach to San Francisco Airport Terminal

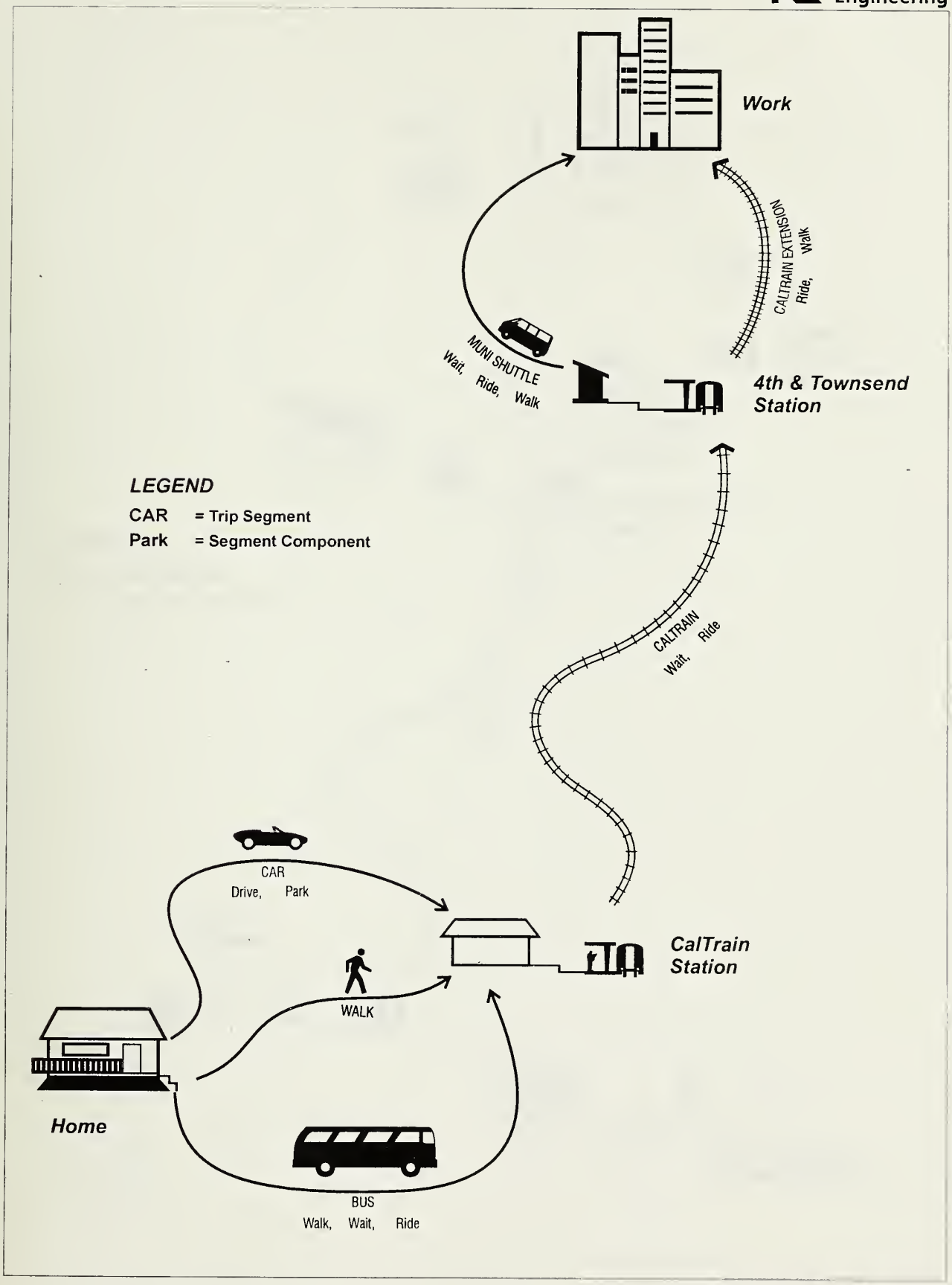
Trip Segment	Access - Bus or Walk			CalTrain Extension		CalTrain		Airport Light Rail			TOTAL	Travel Time
Segment Component	Walk	Wait	Ride	Wait	Ride	Wait	Ride	Wait	Ride	Walk		Improvement
1990	7	1	12	-	-	4	29	2	5	2	62	
No Build	7	1	12	-	-	2	26	2	5	2	57	
Extension to TBT	2	3	5	2	2	-	24	2	5	2	47	18%

8. Palo Alto to Berkeley

Trip Segment	Access	CalTrain		CalTrain Extension		MUNI Shuttle			BART			TOTAL	Travel Time
Segment Component	Walk	Wait	Ride	Ride	Walk	Wait	Ride	Walk	Wait	Ride	Walk		Improvement
1990	5	2	50	-	-	2	8	1	2	31	19	120	
No Build	5	2	45	-	-	2	8	1	2	31	19	115	
Extension to TBT	5	2	43	2	4	-	-	-	2	31	19	108	6%

9. Oakland to San Carlos

Trip Segment	Access	BART			MUNI Shuttle				CalTrain Extension		CalTrain			TOTAL	Travel Time
Segment Component	Walk	Wait	Ride	Walk	Wait	Ride	Walk		Wait	Ride	Wait	Ride	Walk		Improvement
1990	18	2	21	1	2	8	-		-	-	4	52	3	111	
No Build	18	2	21	1	2	8	-		-	-	2	47	3	104	
Extension to TBT	18	2	21	4	-	-	-		2	2	-	45	3	97	7%



CALTRAIN DOWNTOWN EXTENSION

Figure 3.1

Schematic Portraying A Typical Commute Trip From Peninsula to San Francisco

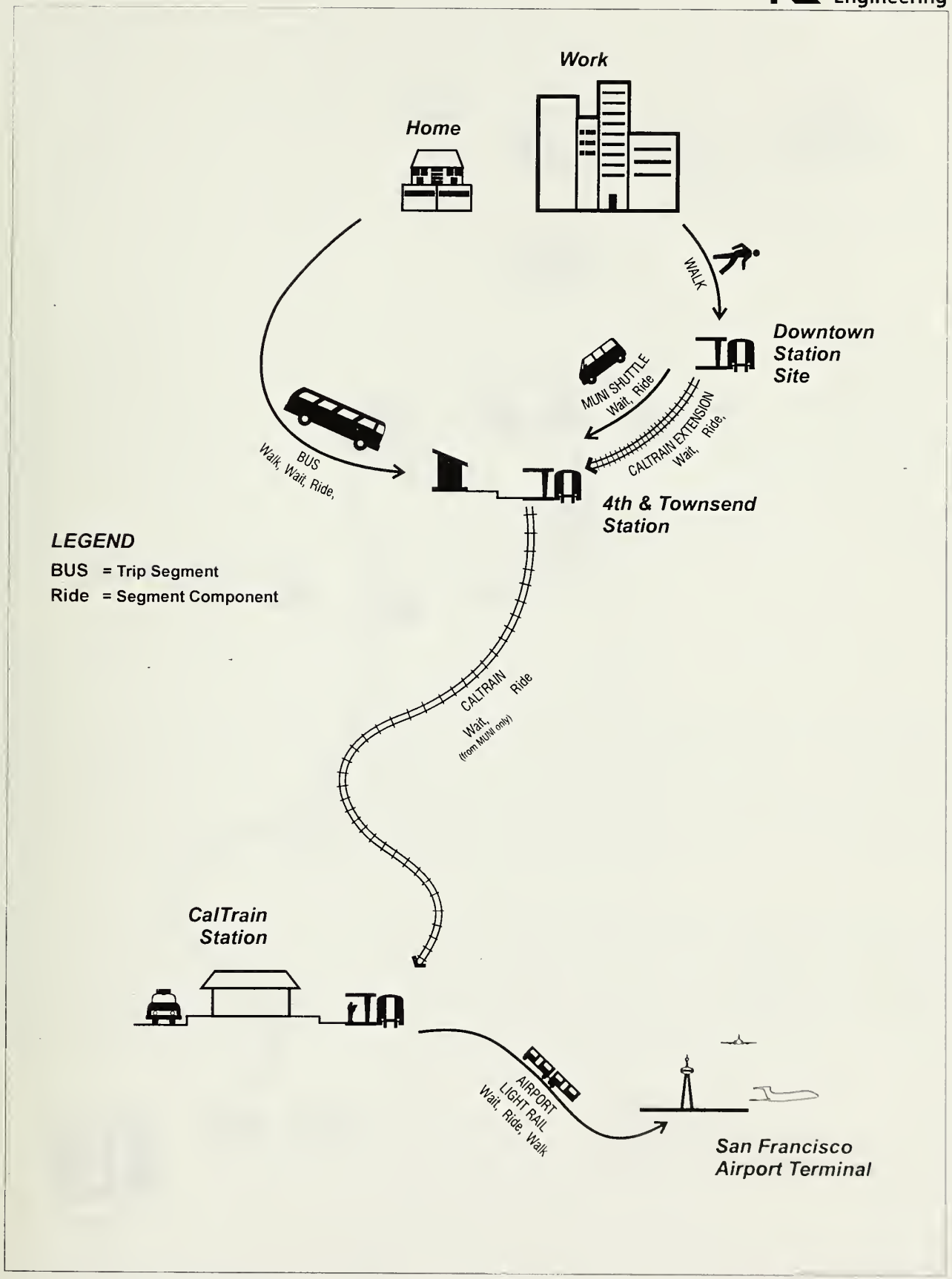
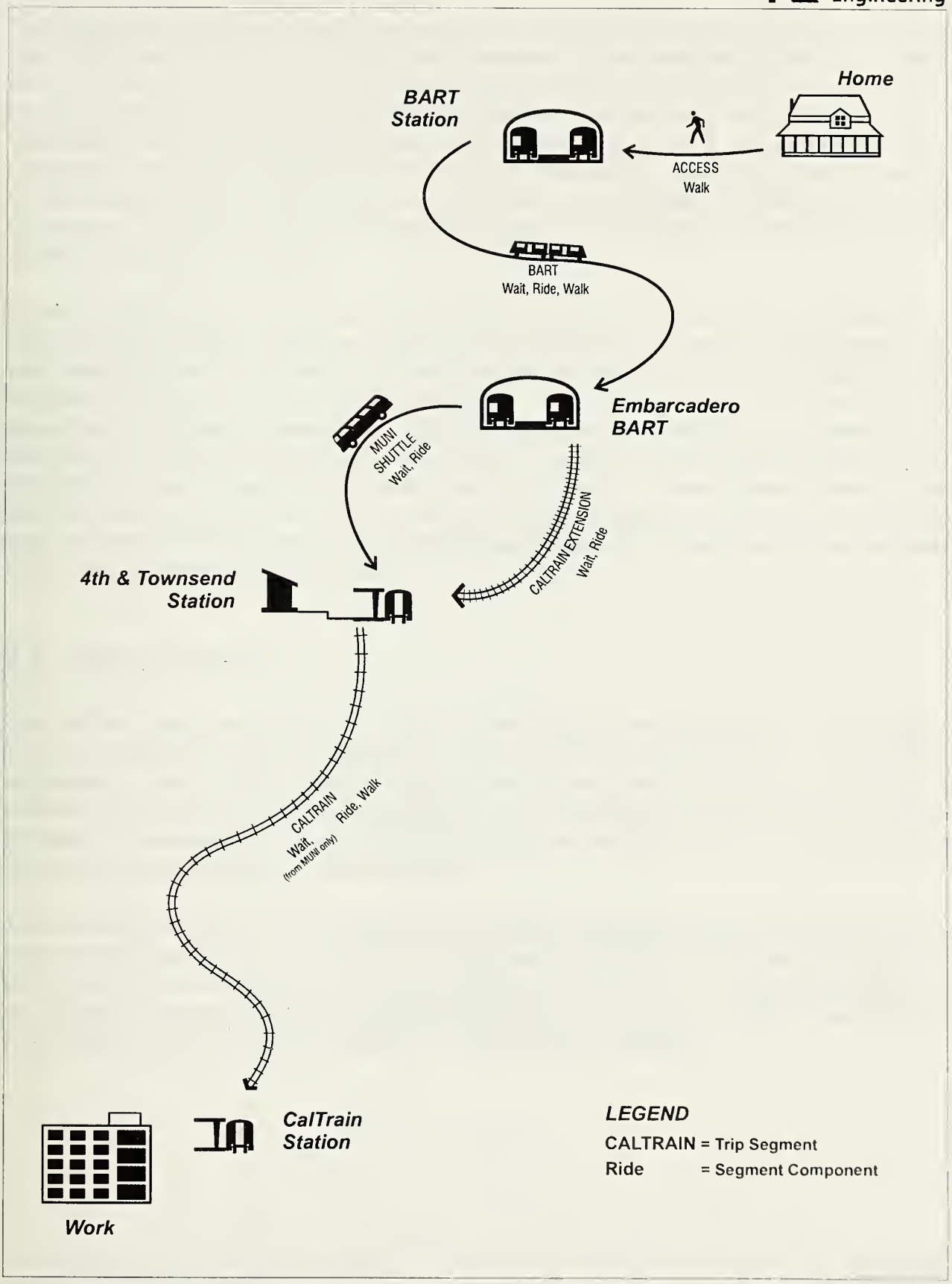


Figure 3.2

Schematic Portraying A Typical Trip From San Francisco to Airport



CALTRAIN DOWNTOWN EXTENSION

Figure 3.3

Schematic Portraying A Typical Commute Trip From East Bay to Peninsula

Comparisons were also made of the travel times for making these representative trips by auto. The results are shown in Table 3.3. Auto trips were assessed in three categories: drive alone, shared ride - 2 persons, and shared ride - 3 persons. High Occupancy Vehicle (HOV) lanes would exist on many of the facilities that would be used to make these representative auto trips in 2010, and these lanes would have a significant effect on travel time. The 2- and 3- person distinction was necessary to account for differing rules for the lanes. For example, the bypass lanes at the Bay Bridge toll plaza require three persons, but the HOV lanes on the Bayshore Freeway only require two persons. For some of the trip interchanges, there are no HOV lanes, and the travel time for all three auto modes is the same.

For each representative trip, auto travel times are less than the transit travel times. However, the auto times do not reflect parking costs, which could be significant in Downtown San Francisco, or the uncertainty that occurs with auto travel along the Peninsula and in San Francisco due to accidents of other incidents that cause congestion. Auto travelers never know when they will encounter unexpected congestion that could significantly lengthen their trip. They consequently leave early to make sure that they will arrive on time. A transit trip, though it takes longer, is much more likely to take the same amount of time day in and day out. Table 3.3 also shows that the CalTrain Extension would have a beneficial impact on traffic congestion. In every case, auto travel times decrease under the Transbay Terminal Extension Alternative. These results were obtained from the San Mateo Countywide model.

3.3 Mode of Access

The CalTrain daily rider entries and exits by mode of arrival and departure for the Transbay Terminal Extension Alternative assuming 86 weekday trains are shown in Table 3.4. The number of transfers at each CalTrain station reflects a transfer percentage equal to the percentage of transfers noted in the MTC 1994 RTP forecasts. The column labeled "Air Trips Entries and Exits" in Table 3.4 indicates both the productions and attractions at each station. The numbers were derived using the San Mateo Countywide model.

The percentage of CalTrain riders using the San Francisco terminal station that transfer to another transit system was compared. Currently, JPB staff estimate that 85% of CalTrain riders transfer to other transit systems at 4th and Townsend Streets in San Francisco. Peak period data from the San Mateo Countywide model indicates that this transfer rate will drop to 64% for the No Build Alternative, and to 22% for the Transbay Terminal Extension Alternative.

Table 3.3
AM Highway Travel Times for Selected Trips

1. San Jose to San Francisco

	Drive	Shared Ride	
Alternative	Alone	2-Person	3-Person
1990	61	57	57
No Build	63	58	58
TBT	62	56	56

2. Sunnyvale to San Francisco

	Drive	Shared Ride	
Alternative	Alone	2-Person	3-Person
1990	49	48	48
No Build	52	50	50
TBT	49	46	46

3. San Mateo to San Francisco

	Drive	Shared Ride	
Alternative	Alone	2-Person	3-Person
1990	27	27	27
No Build	29	29	29
TBT	25	25	25

4. Burlingame to San Francisco

	Drive	Shared Ride	
Alternative	Alone	2-Person	3-Person
1990	24	24	24
No Build	24	24	24
TBT	22	22	22

5. San Bruno to San Francisco

	Drive	Shared Ride	
Alternative	Alone	2-Person	3-Person
1990	22	22	22
No Build	19	19	19
TBT	18	18	18

6. San Francisco to San Francisco Airport Termina

	Drive	Shared Ride	
Alternative	Alone	2-Person	3-Person
1990	16	16	16
No Build	17	17	17
TBT	16	16	16

7. North Beach to San Francisco Airport Terminal

	Drive	Shared Ride	
Alternative	Alone	2-Person	3-Person
1990	19	19	19
No Build	20	20	20
TBT	18	18	18

8. Palo Alto to Berkeley

	Drive	Shared Ride	
Alternative	Alone	2-Person	3-Person
1990	48	48	48
No Build	55	48	48
TBT	48	47	47

9. Oakland to San Carlos

	Drive	Shared Ride	
Alternative	Alone	2-Person	3-Person
1990	48	44	41
No Build	59	54	39
TBT	49	48	37

3.4 Parking Demand at CalTrain Peninsula Stations

The analysis of parking demand was aimed at determining the additional parking supply needed at Peninsula CalTrain stations to meet the demand created by the downtown extension. This consisted of comparing the estimated parking demand at CalTrain stations (which was unconstrained) under the Transbay Terminal Extension Alternative to the existing parking supply of CalTrain lots. The system-wide parking deficit was estimated at 2,490, as shown in Table 3.5. As shown in the table, normalized drive-access productions were converted to drive-access trip origins, and then reduced by a factor of 20 per cent representing a drop-off (or kiss-and-ride) component. The resulting vehicles arriving at CalTrain stations in the AM were then compared with 1995 parking capacity at CalTrain stations to identify projected parking shortfalls.

Table 3.4
Transbay Terminal Extension Alternative
CalTrain Daily Entries and Exits by Mode of Arrival (86 Daily Trains) /1/

Station	Home-Based Work Arrival and Departure by Mode		HBW Entries & Exits	Non Work Arrival and Departure by Mode		NW Entries & Exits	Air Trips Entries & Exits	Daily Entries & Exits
	Walk/Xfer	Auto		Walk/Xfer	Auto			
Transbay Terminal	16,044	0	16,044	1,412	0	1,412	299	17,755
4th/Townsend	2,163	77	2,241	1,145	0	1,145	216	3,601
22nd Street	4	49	53	144	0	144	18	215
Paul Ave	365	0	365	21	0	21	87	473
Bayshore	56	48	105	105	0	105	0	209
South SF	599	257	856	257	0	257	0	1,114
San Bruno	154	573	727	252	0	252	0	980
SFO Ext	0	0	0	0	0	0	0	0
Millbrae	1,263	1,366	2,629	2,096	0	2,096	1,230	5,955
Broadway	291	407	698	530	0	530	13	1,241
Burlingame	528	678	1,206	800	0	800	33	2,039
San Mateo	829	830	1,659	894	0	894	34	2,586
Hayward Pk	565	463	1,028	1,069	0	1,069	24	2,121
Hillsdale	1,015	1,816	2,831	1,575	0	1,575	45	4,451
Belmont	543	1,145	1,687	938	0	938	35	2,660
San Carlos	555	1,066	1,621	744	0	744	37	2,402
Redwood City	1,156	1,115	2,271	513	0	513	13	2,797
Atherton	51	131	182	660	0	660	37	878
Menlo Park	923	649	1,572	925	0	925	94	2,591
Palo Alto	2,015	1,056	3,071	2,052	0	2,052	54	5,178
California Ave	1,520	611	2,132	1,364	0	1,364	102	3,598
Castro	602	112	714	498	0	498	4	1,216
Mountain View	1,175	751	1,926	1,117	0	1,117	76	3,119
Sunnyvale	1,172	988	2,160	1,719	0	1,719	49	3,929
Lawrence	768	306	1,073	1,204	0	1,204	52	2,329
Santa Clara	710	889	1,598	710	0	710	84	2,392
College Park	459	0	459	805	0	805	0	1,264
San Jose	1,552	1,837	3,389	2,396	0	2,396	111	5,897
Tamien	632	394	1,026	1,464	0	1,464	66	2,556
Capitol	609	0	609	2	0	2	12	623
Blossom Hill	97	0	97	2	0	2	10	109
Morgan Hill	66	82	148	0	0	0	7	155
San Martin	6	38	44	0	0	0	1	45
Gilroy	37	110	147	0	0	0	9	156
Total	38,524	17,846	56,370	27,412	0	27,412	2,852	86,633

Notes:
/1/ All Arrivals are in production-attraction format

SOURCE: San Mateo Countywide Travel Demand Model

Table 3.5
CalTrain Extension to Transbay Terminal (86 Daily Trains)
Estimated Parking Demand of Peninsula Stations

Station Name	Normalized HBW Drive Prods	Normalized HBW Drive AM Arrival/1/	HBW Vehs AM Arrival /2/	1995 Parking Capacity/3/	Supply minus Demand4/
Gilroy	110	55	44	233	189
San Martin	38	19	15	120	105
-	-	-	-	-	-
Morgan Hill	82	41	33	524	491
-	-	-	-	-	-
-	-	-	-	-	-
Blossom Hill	0	0	0	407	407
Capitol	0	0	0	317	317
Tamien	394	197	158	400	242
-	-	-	-	-	-
-	-	-	-	-	-
Cahill	1837	919	735	645	-90
College Park	0	0	0	0	0
Santa Clara	889	444	355	330	-25
-	-	-	-	-	-
Lawrence	306	153	122	120	-2
-	-	-	-	-	-
Sunnyvale	988	494	395	204	-191
Mt View	751	376	300	250	-50
Castro	112	56	45	0	-45
California	611	306	245	188	-57
Stanford	0	0	0	0	0
Palo Alto	1056	528	422	364	-58
Menlo Pk	649	325	260	147	-113
Atherton	131	66	52	286	234
-	-	-	-	-	-
-	-	-	-	-	-
Redwood City	1115	558	446	703	257
-	-	-	-	-	-
-	-	-	-	-	-
San Carlos	1066	533	426	244	-182
Belmont	1145	572	458	203	-255
-	-	-	-	-	-
Hillsdale	1816	908	726	170	-556
Bay Meadows	0	0	0	0	0
Hayward Park	463	231	185	21	-164
-	-	-	-	-	-
San Mateo	830	415	332	205	-127
-	-	-	-	-	-
Burlingame	678	339	271	58	-213
Broadway	407	203	163	146	-17
Millbrae	1366	683	546	200	-346
-	-	-	-	-	-
San Bruno	573	287	229	169	-60
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
South SF	257	129	103	51	-52
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
Bayshore	48	24	19	41	22
Paul Ave	0	0	0	0	0
22nd St	49	25	20	24	4
San Francisco	77	39	31	0	-31
-	-	-	-	-	-
TBT	0	0	0	0	0
Total Entries	17846	8923	7138	6770	
Sum of Parking Deficits at Relevant Stations					-2490

Notes:

/1/ "Normalized HBW AM Station Arrivals" reflect HBW drive-access productions converted to trip origins

/2/ "HBW Vehicles Arriving in AM" reflects subtraction of system-wide factor of 20% in future representing "drop-off" component

/3/ 1995 JPB Caltrain Parking Survey (Caltrain lots only)

/4/ "Supply-Demand" calculated as "1990 Parking Capacity" minus "HBW Vehicles Arriving in AM":
Shaded cells indicated parking shortfalls that cannot be accommodated at adjacent stations. Sum of shaded cells=2,490

3.6 Change in Ridership due to the Elimination of the 4th and Townsend Station

The forecasting results presented have been predicated on keeping a station to serve the Mission Bay area near the site of the existing 4th and Townsend station in San Francisco. A variety of other studies have assumed that a station would exist there in the future. The market that would be served by this station (or one within two to three blocks of it) is expected to change in the future due to changes in land uses that might occur in the Mission Bay area, such as the proposed Giants ball park. Various proposals exist (though no definite plans have been specified) as to how the area could be developed, ranging from a significant increase in jobs plus some residential development, to no increase in jobs and a significant increase in housing, or an entertainment complex.

One of the location options for the tunnel portal places the CalTrain alignment in a tunnel along Townsend Street and does not include a station in the vicinity of Mission Bay. Therefore it is important to look at the effect on CalTrain ridership of removing this station. Table 3.6 presents the CalTrain daily boardings and alightings for the extension of CalTrain to the Transbay Terminal combined without a replacement for the 4th and Townsend station. For comparison, boardings and alightings for the extension with the Fourth and Townsend Station and 1990 boardings and alightings are also shown. There would be a decrease of 800 system entries if the Mission Bay station was not included in the Transbay Terminal Extension Alternative.

3.7 Inputs to CalTrain Operating & Maintenance Cost Model

CalTrain ridership forecasts have been reported in terms of average weekday boardings. Revenue forecasts, which are a component of the assessment of subsidy requirements and the overall cost-effectiveness of the project, and operating and maintenance cost estimates are typically prepared based on annual ridership. Consequently, factors were developed to expand the weekday numbers to represent annual ridership. Using existing ridership figures, Saturday and Sunday ridership are currently about 40 percent and 25 percent of weekday ridership, respectively, yielding an annualization factor of approximately 278 for CalTrain ridership. Annual ridership figures are presented in Chapter 5.

Table 3.6
Caltrain Daily Boardings and Alightings for
Option to Remove 4th and Townsend Station - Extension to Transbay Terminal

Station Name	1990 Existing	2010 TBT With 4th/Townsend	2010 TBT Without 4th/Townsend	Difference Without 4th/Townsend
Transbay Terminal	-	17,800	20,300	2,500
4th/Townsend	12931	3,600	0	-3,600
22nd Street	455	200	500	300
Paul Avenue	99	500	500	0
Bayshore	372	200	200	0
South SF	984	1,100	1,100	0
San Bruno	980	1,000	1,000	0
Millbrae	1075	6,000	5,700	-300
Broadway	763	1,200	1,200	0
Burlingame	1182	2,000	2,000	0
San Mateo	1155	2,600	2,500	-100
Hayward Park	1224	2,100	2,100	0
Hillsdale	1981	4,500	4,400	-100
Belmont	1184	2,700	2,600	-100
San Carlos	1350	2,400	2,400	0
Redwood City	1700	2,800	2,800	0
Atherton	462	900	900	0
Menlo Park	1539	2,600	2,600	0
Palo Alto	2124	5,200	5,200	0
California Avenue	1919	3,600	3,600	0
Castro	456	1,200	1,200	0
Mountain View	1700	3,100	3,100	0
Sunnyvale	1703	3,900	3,800	-100
Lawrence	1065	2,300	2,300	0
Santa Clara	1194	2,400	2,400	0
College Park	208	1,300	1,300	0
San Jose	3747	5,900	5,900	0
Tamien	-	2,600	2,500	-100
Capitol	-	600	600	0
Blossom Hill	-	100	100	0
Morgan Hill	-	200	200	0
San Martin	-	0	0	0
Gilroy	-	200	200	0
Entries + Exits	43,552	86,800	85,200	-1,600
System Entries	**21,776**	**43,400**	**42,600**	**-800**

Note: 86 daily trains assumed

SOURCE: San Mateo Countywide Travel Demand Model

4.0 Evaluation

This chapter summarizes the results of the CalTrain ridership forecasting efforts by comparing key measures for each of the alternatives. It also summarizes the conclusions of the ridership forecasts. The results demonstrate that the downtown extension would significantly improve travel on the Peninsula and in the Bay Area, and be much more attractive to riders.

4.1 Summary of Ridership Forecasts

The CalTrain downtown extension alternative is compared to existing conditions in Table 4.1. These figures summarize those reported in Chapter 4 or are derived from information presented in that chapter.

With the downtown extension, CalTrain system ridership in 2010 would double compared to 1990. Ridership in 2010 would be 33 percent higher with the Transbay Terminal extension than with the No Build alternative. There would be almost 5,000 net new daily transit riders. CalTrain entries and exits at the San Francisco terminal would increase by almost 40% compared to 1990. The comparison in 2010 is even greater, because by then the BART Airport Extension would be in place, and a significant portion of CalTrain riders would be expected to transfer to BART at the Millbrae station if the CalTrain Downtown Extension is not implemented at that time. There would be a substantial decrease in the percentage of riders that would need to transfer to another transit system at the San Francisco CalTrain terminal. Compared to a transfer rate of 85% in 1990, the CalTrain Downtown Extension would result in a transfer rate of only 22% in 2010.

Table 4.1
Summary of CalTrain Forecast Results

Measure	1990	Downtown Extension Alternative	
		No Build 2010	Transbay Terminal 2010
Daily System Entries	21,780	32250	43,400
Annual Ridership	6 million	9.0 million	12.1 million
Daily San Francisco Terminal Entries and Exits	12,900	5,800	17,800
Percent Transfer at San Francisco Terminus in Peak Period	85%	64%	22%
Transit Linked Trips in Corridor	562,000	662,200	667,000
Transit Mode Share -- San Mateo to San Francisco	15%	19%	20%
Transit Mode Share -- Santa Clara to San Francisco	13%	22%	27%
Daily AM Peak Hour Vehicle Hours of Travel (VHT)	373,900	574,300	516,000
Proportion of AM Peak Hour VHT that is Delay	35%	45%	40%
Daily AM Peak Hour Vehicle Miles of Travel (VMT)	8,655,700	11,420,900	11,275,500
AM Peak Hour Roadway Average Speed	23.1 mph	19.9 mph	21.9 mph

4.2 Conclusions

In Chapter 1, the objectives for the CalTrain Downtown Extension Project were presented. These included increased CalTrain ridership, as well as reductions in CalTrain travel time, roadway traffic

congestion, and automobile use. The analysis described in this report demonstrates that the CalTrain Downtown Extension will have the following positive effects on travel in the Peninsula Corridor and the Bay Area:

- CalTrain would have about 4,800 more daily riders with the Downtown Extension than it would have without the extension. These are 4,800 trips that would otherwise be on the freeway. This is a volume that would be equivalent to a new freeway lane.

- The percentage of CalTrain riders that would transfer to other transit systems at the San Francisco terminal would drop from about 64 percent to 22 percent. This demonstrates the ability for riders to walk to their final destination if CalTrain were extended to downtown.

- Travel times for CalTrain trips to or through Downtown San Francisco would be reduced by 6 to 23 percent. Besides saving time for CalTrain passengers, this would make using transit on the Peninsula more time-competitive with using an auto.

- The proportion of delay in regional morning peak hour roadway vehicle travel would drop from about 45% to 40%. This would mean less congestion on the region's freeways.

- Regional morning peak hour vehicle miles of travel would drop from about 11.4 million to 11.3 million. A reduction in vehicle miles would correspond to a reduction in air pollution.

- Regional daily person hours of travel in vehicles would drop from about 6.6 million to 6.2 million. This would a savings of 400,000 hours every day.

Overall, the CalTrain San Francisco Downtown Extension would increase transit ridership, reduce transit travel times, reduce freeway congestion, improve air quality, allow CalTrain riders to walk to their final destinations in downtown San Francisco instead of taking a shuttle bus, and improve connections with BART, AC Transit, Golden Gate Transit and MUNI.